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Practical and Theoretical Mechanics and Chemistry.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

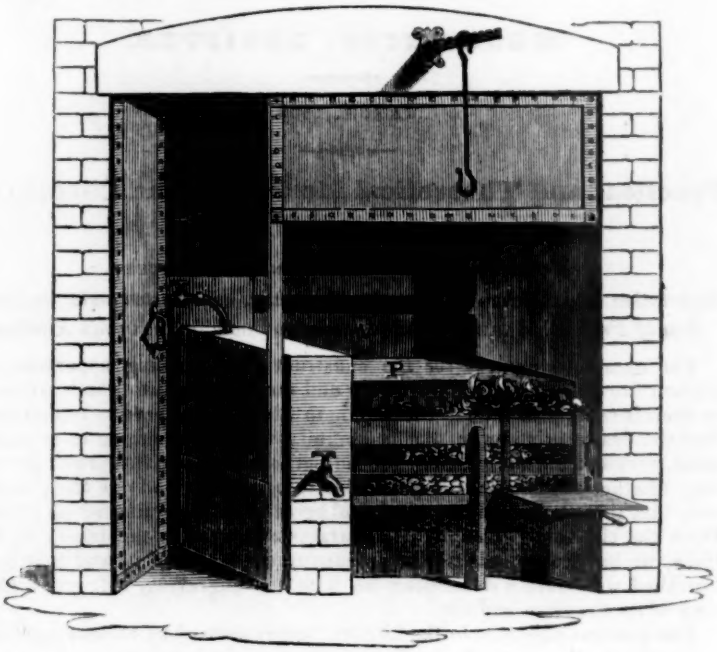
Description of a Kitchen Range, and Fire place, constructed under the direction of Prof. R. HARE, *of Philadelphia, and now in use in his Kitchen.*

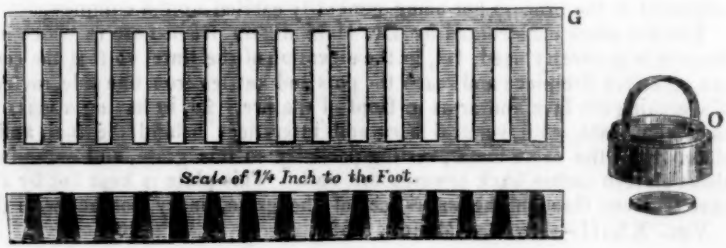
The numerous devices for the construction of cooking apparatus and kitchen fire-places, and the unceasing and successful efforts which are made by their inventors to induce the public to adopt them, serve to render manifest the desire existing in the community to find something more convenient, economical, and efficient for the purpose than such as are in general use; whether this is attainable, remains to be proved, and one thing is certain, that there never will be a general agreement respecting which is best. From the character given of the apparatus employed in the family of Dr. Hare, we have been induced to procure an engraving of it, and have been furnished with such a description as, with the engraving, will give a clear view of its structure and use.

The greatest objection to the kitchen ranges devised by various ingenious projectors, is the want of simplicity. Cooks will not take the trouble of learning to use them, or, which is necessary, to keep in order the various novel articles by which they are accompanied. Stoves are objectionable, when used for cooking, on account of the annoying fumes of the articles subjected to the process not being generally carried up the chimney.

The fire place constructed by Dr. Hare differs from those in which anthracite is generally used, 1st, in the elevation of the lintel so that the cook can enter the fire-place and reach the pots and kettles from one side, instead of scorching the face and arms in front of the fire. 2d, in having a massive cast iron grate, with vertical bars and interstices behind the fuel, and a plate, P, of the same metal, resting partially on this grate, and extending about sixteen inches back towards the wall. This plate is kept hot by the heat received through the interstices of the grate, or by contact with the

mass of iron of which they constitute a part. A gentle draught takes place under this plate in consequence of a space left between it and the back wall, and another plate placed parallel to the wall vertically. Between this plate and the wall, the air, being warm, rises, and thus causes an effort in the adjoining air to enter and replace it. The horizontal plate is in fact made so hot as to keep pots and kettles boiling after being once made to boil on the fire. This plate serves also the purpose of an oven. A pie or pudding, being supported on the plate, with the interposition of a brick or tile between them; the cover of sheet iron, represented at (O,) is placed over it, and live coals are placed upon the top of the cover in sufficient quantity to produce a baking or a browning heat. Of course this process is applicable to the operation of browning meat previously stewed.





The boiler on the side of the fire not only serves to keep up a supply of hot water, but is likewise a defence to the cook in handling the pots and kettles from the side. Although the chimney, while wood was used in it as fuel, often failed to carry off the smoke, there has been no inconvenience arising from that cause since the plan above described was resorted to. Contrary to expectation, the chimney draws well at all times, without closing the door. In the association of the permanent boiler with the grate, it is not pretended that there is any thing new. In Dr. Hare's kitchen, water is supplied by a cock terminating a hydrant pipe; but the contrivance called the ball cock would be preferable; and it would be still more advantageous to have a cylindrical water-tight vessel capable of bearing the pressure of the water from the water works, agreeably to the plan pursued by Messrs. Morris, Tasker and Morris. By a boiler of that kind a constant supply of hot water is had without the trouble of replenishing the containing vessel.

It is important that the back grate should be very stout; it should form a large mass of metal, for its own protection in the first place; and in the second, in order that it may, by the conducting process, transfer heat from the fire to the plate resting upon it at the front edge. By these means it proves a reservoir of caloric, and serves to detain and render it more useful. The weight of the grate employed is eighty-four pounds.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Novel Mode of Cooking Tough Meat, so as to render it Tender.

It was stated to Dr. Hare, by Mr. Jacob Perkins, now of London, that an old fowl, or a tough piece of meat, might be made tender by exposing it to the temperature of boiling water for a considerable length of time, the meat being placed in a vessel into which the water did not enter. The experiment was tried by Dr. Hare on a tough piece of beef; the apparatus used by him consisted of two vessels, one placed within the other, the space between them being filled with water, and the beef being closely covered in the inner one. The water was kept boiling for nearly twelve hours, and the results verified the statement of Mr. Perkins; the meat was rendered tender, and, with the aid of proper condiments, an excellent bouillie was obtained. Steam, of course, might be substituted for the boiling water, as the requisite degree of heat would be obtained by causing it to pass round the vessel containing the meat.

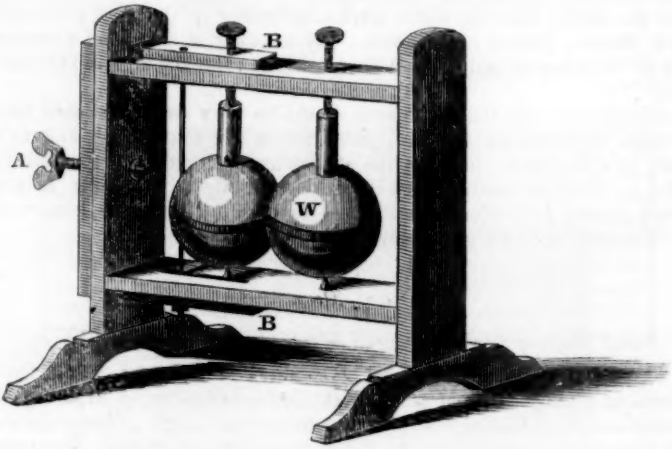
FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Apparatus intended to show that if heat be motion, the capacity of Mercury should be greater than that of Water. By R. Hare, M. D., *Prof. of Chemistry, University of Pennsylvania.*

Sir Humphry Davy had suggested that heat might be ascribed to a gyratory or vibratory motion in the particles of ponderable matter. I have urged that if heat were motion, the laws of its communication should be analogous to those which operate between moving masses, and that as in the latter case the heavier body would have most influence in communicating motion, so in the former the heavier body should be more efficacious in communicating heat. Yet the facts were totally opposite to this community of result. Mercury, nearly 13.6 times heavier, bulk for bulk, than wa-

ter, and of course in communicating motion as many times more potent, had, in communicating heat, an effect only the half of that producible by a like bulk of water. A similar incongruity existed in every instance where the heating influence of a metal could be compared to that of water.

Professor Olmsted, of Yale College, alleged the law of motion to which I appealed, only to avail in case of motion in right lines: that it could not be applicable in the case of gyratory or rotary momentum. To verify he truth of my postulate, by ocular proof before my pupils, the apparatus epresented below was contrived.



Both the globes, represented in the engraving, are of wood, but one of them, W, is loaded with a zone of lead. Either of the globes may be made to revolve upon its axis with great rapidity, by applying a string as in spinning a humming top. When one of the globes is set in motion, it is not to be in contact with the other, but by means of the slides at B, B, governed by a screw A, complete contact may be produced between them without disturbing that to which motion has been communicated. The momentum previously induced in one is thus divided between both, and the difference of its duration, accordingly as the heavier or lighter globe is the mean of communicating it to the other, is strikingly in favour of the heavier globe. I will not add Q. E. D., because I should have supposed that the issue would have been sufficiently self-evident to every person having any knowledge of the subject, either in practice or in theory, yet as I was contradicted, flatly, by a respectable professor, and one for whom, personally, I have no small regard, I thought it best to prepare for my medical pupils, who are not supposed to be generally acquainted with mechanics, an ocular proof of the position on which my reasoning had been founded. The experiment has always excited much interest, and lessened the tedium of a theoretic discussion, in general abstruse, and unsusceptible of pleasing illustrations.

Physical Science.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Col. Reid's Law of Storms examined. *By* J. P. Espy.

Continued from p. 50.

The following investigation of the storm of 1821, was written early in the year 1838, and presented to the Joint Committee of the American Philosophical Society and the Franklin Institute by me, in my official capacity as meteorologist of that Committee; but it was not accepted. I now publish it on my own responsibility; and as this storm has been copied by Col. Reid into his book, it may now be considered as a part of the examination of his law of storms, though it was written before his book was published. This much it was necessary to say in explanation of the peculiar phraseology of what follows, since it is published verbatim as it was read to the Committee.

Philadelphia, Jan. 10, 1838.

Gentlemen:—As the meteorological instruments ordered by the Committee have not yet all been made, and distributed to the several counties of the state, and as recent materials have consequently not yet been furnished to your meteorologist for a report, I have thought it would be interesting and useful to the cause in which we are engaged, to investigate the phenomena connected with the great storm which visited our coast Sept. 3d, 1821.

I have chosen this storm in preference to others, because materials for its investigation are more abundant, and also because Mr. Redfield thinks "there is but one satisfactory explanation of the phenomena. "*The storm was exhibited in the form of a great whirlwind.*"

Now it is of immense importance to the mariner that he should have correct views on this point—and I propose to demonstrate that this storm at least was not exhibited in the form of a whirlwind, but was like the twelve storms which have been investigated by the Joint Committee of the American Philosophical Society and the Franklin Institute, that is, the wind blew inwards at its borders.

This conclusion is rendered certain by the following facts, which are deductions from the particulars given below.

1st. The storm set in every where on the extreme south-east border from the south-east, and not from the south-west, and changed round to the S. S. W. or S. And on the extreme N. W. border it set in from N. N. E., and blew hardest from the N. and N. W. Now on the extreme S. E. border it could not blow from the S. E. at all, on the supposition that it was a whirlwind; nor, on the N. W. side, could it blow at all from the N. W. Both facts, however, are not only consistent with a centripetal motion of the air, but absolutely prove it.

2d. Wherever the wind set in from the E., it always changed round by the S., which is consistent with the centripetal, and inconsistent with the centrifugal, theory.

3d. There never was a lull mentioned, only where the wind set in from the N. E., which has the same bearing as before, for the centre of the storm only can have a lull.

4th. Where the wind set in from the S. E., there is no lull mentioned previous to a change of wind, and in no instance could I find that it changed round to N. W. Two instances are given by Mr. Redfield, one at Bridgeport, Conn., which I find is incorrectly reported, and instead of changing

round to N. W., it should read to S. W.—the other at sea, 40 miles N. of Cape Henry; this I could not find, and I suspect there is something wrong in it, for 40 miles N. of Cape Henry is not at sea, but in the eastern shore of Virginia. At other places in a right line with this, it set in from the N. E., e. g. at Cape May and Norfolk.

5th. Along the seaboard, where the wind had been S. and S. E. all day, at the approach of the storm, it backed round towards the E. and E. N. E.; and inland, where the wind had been N. W., it backed round towards the N. and N. E. on the approach of the storm.

6th. Wherever the wind set in from the N. E., it ought not to have changed at all, according to the centrifugal theory, whereas it did actually always change round by the N. to N. W. or W., or by the S. to S. W., as it should do by the centripetal theory.

7th. According to the centrifugal theory, the wind never could change round on the extreme N. W. boundary from the N. N. E. to the N. W. as it did, according to the centripetal theory.

8th. On the extreme S. E. boundary it could not blow at all from the S. E. according to the centrifugal theory: but it did according to the centripetal theory, blow in that direction in many places on that border, for 6 or 8 hours during the whole strength of the gale.

9th. On the extreme N. W. border, according to the centrifugal theory, it could not blow the hardest from the N. W., nor on the extreme S. E. border could it blow the hardest from the S. E., as it did in exact conformity with the centripetal theory.

10th. At Cape May it changed round from N. E. by E., and at Cape Henlopen it changed round from N. E. by N., in conformity with the centripetal, and entirely contradictory to the centrifugal, theory.

11th. Both in Norfolk and New York, the wind set in from near the N. E., and at the termination blew from the S. W., which is the experimentum crucis in favour of the centripetal theory, and utterly inconsistent with the other. In like manner at Ocracoke, it set in E. S. E. and terminated S. S. W., and out at sea, in the extreme eastern borders of the storm, the wind blew for 8 or 10 hours from S. E. and S. by E., with but little change, as it ought to do, if the wind does actually blow towards the centre of the storm.

12th. At the time the wind changed round to S. S. W. at Ocracoke, it was blowing at Norfolk a violent gale N. E., nearly towards Ocracoke. Now as these places are 130 miles apart, and nearly on opposite sides of the storm at that moment, it is utterly impossible, according to the whirlwind theory, that the wind at Ocracoke should be blowing towards Norfolk, and, at the same time, the wind at Norfolk be blowing towards Ocracoke. And this fact is entirely consistent with the centripetal theory.

The wind also changed round at Norfolk S. W. sometime before it set in from the N. E. at New York. Also two ships at sea, opposite the Jersey coast, had the wind blowing a gale from E. S. E. to S. S. E. At the same time, the wind was violent at Philadelphia and Reedy Island from N. N. E. to N. W. Now these places were nearly in opposite sides of the storm; the wind was therefore centripetal as it blew from each towards the other. Also while the storm was passing over Connecticut, the wind blew constantly, in the S. E. corner, from the S. E., while at the same time, in the N. W. corner of the state, the wind was blowing a furious gale from the N. W.; and Mr. Redfield himself testifies that the "trees and corn in this corner of

the state were uniformly prostrated towards the S. E., while even as far inland as Middletown, they were uniformly prostrated towards the N. W."

"It appears," says Mr. Redfield, "that in the central part of the state of Connecticut, the mass of the atmosphere upon the earth's surface was moving for several hours, apparently towards the N. W., with a probable velocity of 75 to 100 miles per hour, while in the northern parts of Litchfield county, (that is, in the N. W. parts of the state,) at a distance of say 40 miles, the wind, at about the same period, was blowing with nearly equal violence towards the S. or S. E."

Now, as the wind at New York changed round to "S. W., and blew away the clouds with astonishing quickness," about the time that these currents of air were rushing towards each other, from the S. E. and N. W. of the state of Connecticut, we have three points, S. E. and S. W. and N. W. in the borders of the storm, from which the wind blew towards the centre. This fact alone would establish the truth of the centripetal theory, at least in this storm.

We have no account how the wind blew to the N. E. of the point in Connecticut, towards which these three currents blew, but as the wind set in from the N. E. in front of the storm wherever we have any account, it is highly probable that here too the wind was blowing from the N. E. at the same time.

We have, then, the most decisive evidence that the wind, during the whole progress of this storm along our coast, blew inwards, at its borders, towards its central parts.

I do not say that the wind blew to one central point from every part of the circumference—this is hardly to be expected, even if the storm was perfectly circular, for reasons too obvious to require explanation.

But it seems almost certain that the diameter of the storm was much longer from S. W. to N. E. than from S. E. to N. W. The wind was only beginning to abate at noon, to a ship 75 miles S. by E. from Cape Hatteras, and this was the time the storm was commencing at Reedy Island, not far below Philadelphia. The diameter of the storm, therefore, in this direction was more than 300 miles, whilst its diameter from N. W. to S. E. could hardly have been half this quantity, for the storm was not felt at Wilmington, N. C. nor at Baltimore. And two ships off our coast, one from Charleston bound to the Chesapeake, and one from Boston to Norfolk, in latitude 40° 19′, did not experience the gale. And when the storm reached Connecticut, it certainly was not more than about 100 miles broad in this direction, for at Providence it was not of a violent character, and about 50 miles N. W. of that city, the centre of the storm passed, so that here its S. E. semi-diameter was only about 50 miles. Between the Delaware Capes, also, the centre of the storm passed; for the wind changed round by E. at Cape May, and by N. at Cape Henlopen—and as the storm did not reach Baltimore, its N. W. semi-diameter was not more than 50 miles.

The shape of the storm, then, not being round, as Mr. Redfield believed, is unfavourable to the whirlwind theory, and will satisfactorily explain the circumstance that the wind did not blow exactly at times towards one central point—there was no such *point*, the centre was a *line* of considerable length.

The hypothesis of a whirlwind in this storm is therefore not true in fact; and if it was true, it is totally incapable of explaining any of the phenomena.

It does not explain the cause of the rain and hail. For, if there was a whirlwind of such violence as to make the wind in the borders of the storm

move with a velocity of 75 or 100 miles an hour at the surface of the earth, the air must have come downwards in the centre with very great velocity, a velocity calculated in my third number, unless the whirling motion extended to so great a height that the air at the surface of the atmosphere could not get in.

If indeed the rotary velocity was much greater in the middle region of the air than at the surface of the earth, or the upper regions, then the air would rush upwards below, and downwards above, towards the middle region, and the cloud there formed, if one should be formed, would be seen whirling round with great velocity and spreading outwards with proportionate rapidity. In this way, large quantities of the upper part and lower part would be mingled together—and it seems to be generally, though erroneously, believed, that the upper part, being much colder than the lower, when they meet and mingle, condensation of vapour would be the result. But as it is known from experiment, that if the air, at the temperature of 32° at the surface of the earth, should rise in the atmosphere to where the air would be expanded into double the volume, it would be colder by about 90.9°, and if the air should sink from the surface of the atmosphere to where the barometer stands 15 inches, it would rise in temperature about 90°, it follows that when these two masses of air met, the upper mass would be the warmest, and its capacity for vapour being thus very much increased, its tendency, on mingling with the lower air, would be to prevent the formation of cloud, and if a cloud was formed at all, it would be by the cold of the lower portion.

But besides the impossibility of finding any cause for this whirlwind in mid-air, it is contradicted by the whole appearance of the cloud connected with a tempest, whenever an observer is so situated as to see the whole cloud. For the circumference of the cloud always appears almost motionless, while the tempest is raging below with the greatest fury. And the upper part of the cloud, instead of rolling inwards, as it would do if there was a motion in the upper air downwards, seems to spread itself outwards, especially towards the N. E., something in the form of a mushroom, and finally into thin cirrus at the end of the rain.

On the other hand, if the air did really move inwards at the circumference of the storm, all the phenomena attending it may easily be explained on well known philosophical principles.

It could not move inwards at the circumference below, without moving upwards in the middle; it could not move upwards in the middle, without becoming colder, something more than 1° for every 100 yards of elevation, until it reached the point where condensation of the vapour would commence; above which it would cool only about half that quantity, the other half being made up by the latent caloric given out by the condensing vapour—the latent caloric cannot be given out without expanding the air in contact with it about 7000 cubic feet for every cubic foot of water generated, and thus producing a highly diminished specific gravity of the air in a rapidly forming cloud. This diminished specific gravity will cause the barometer to fall at the surface of the earth below, and the air will run inwards and upwards with a velocity which, the fall of the barometer being given, may be calculated where the storm is very narrow, as in spouts, on the principle of spouting fluids.

This upward velocity, where the barometer falls one inch, is about 240 feet a second, and is quite sufficient to cause a condensation of vapour great enough to produce those cataracts of rain which sometimes fall in a

short time over a very limited extent; and also to carry up large drops of rain above the region of perpetual congelation, and throw them off at the side of the ascending column, frozen into hail, sometimes 12 inches deep in 12 minutes. Even the shape of the tornado cloud, or water spout, is explained by the sinking of the barometer under the cloud; for the expansion of the air under the cloud may be so great that the cold produced by that expansion may cause condensation of the vapour in the air below the cloud down to the very ground. I might go on to mention every phenomena connected with storms, and show that they are all explained by the evolution of caloric in condensation of vapour; but this is not my present object.

After making one or two other remarks, I shall proceed to give the particulars from which all these generalizations have been deduced. Mr. Redfield says Dr. Mitchell has recorded, as the result of the observation of labouring people in New York, that when a haze or cirrus, which, appearing at sunset, indicates the approach of a storm, is seen over Staten Island at S. W. or more southerly, the storm of the succeeding day will blow from the *north-east*, but if it appears over the Jersey shore of the Hudson, from W. S. W. to N. W., then the storm is expected to blow from the S. E. From this it would appear that the wind blows towards the cloud of an approaching storm.

What is the shape of storms generally? or do they greatly differ in shape?

Dr. Thomas, of Richmond, N. C., told me that he has frequently seen storms of great length from N. E. to S. W., and very narrow from S. E. to N. W., make their appearance to the N. W. of where he lived, and approach him, coming up, side foremost, against a S. E. wind, pass over in half an hour, with the wind suddenly changing round to N. W. If this should be found to be the shape of those storms at sea, which Mr. Redfield says so often set in from S. E. and change round to N. W., it would be in harmony with the centripetal theory. But I forbear to hypothesize—the day is not far distant when the public will see the importance of having *facts* on this subject ascertained by a system of wide spread simultaneous observations.

Facts collected by Mr. Redfield, taken from Silliman's Journal, vol. XX.

"The earliest supposed trace of this hurricane which has been obtained, is from off Turk's Island, in the West Indies, where it appeared on the first of September, two days previous to its reaching our coast. It was felt there severely, but at what hour in the day we are not informed.

The next account we have is from lat. 23° 43′, where the storm was severe, Sept. 1st, from S. E. to S. W. Whether these two accounts are considered as identifying the storm, or otherwise, will not, at this time, be deemed material.

Our next report is from lat. 32° 30′, lon. 77° west from Greenwich, on the night of Sept. 2d; a hurricane for 3 hours.

At 3 A. M. on the 3d of Sept., a severe gale was experienced 30 miles outside of the American coast, off Wilmington, N. C.

At Wilmington there was no gale.

At Ocracoke bar, N. C., at day light on the morning of the 3d, a severe gale from E. S. E.

At Edenton, N. C. the gale was at N. E.

Off Roanoke, on the morning of the 3d, a dreadful gale at E., then S. W. and N. W.

A vessel from Charleston, S. C., two days previous to arriving in the

Chesapeake, experienced the gale at 4 A. M. on the 3d, from S. E. to W. S. W.

A vessel from Bermuda experienced the gale from the westward, on the inner edge of the Gulf Stream.

Another vessel, from Charleston, did not experience the gale.

In lat. 37° 30′, on the inner edge of the Gulf Stream, gale from the westward, with squalls.

On James River, Va. the gale was severe from N. W.

At Norfolk, Va. the gale raged, on the 3d, for 5 hours, from N. N. E. to N. N. W., and terminated at the latter point; greatest violence from 10 A. M. to 1 P. M.

At sea, 40 miles N. of Cape Henry, severe from S. E. changing to N. W.

Off Chincoteague, coast of Maryland, on the 3d, gale from S. E.

At Snowhill, Md. gale commenced at 11 A. M.

In lat. 38° 30′, lon. 74° 30′, gale S. by E.

Gale reported as slight in the Gulf Stream.

A ship from Boston, bound to Norfolk, experienced nothing of the gale On the 3d, was in lat. 40° 19′; weather foggy, and light winds from S. E.

At Morris River, Del., the gale was from E. S. E.

No Hurricane was felt at Baltimore.

At Cape Henlopen, Del., the gale, or hurricane, commenced at half past 11 A. M. from E. S. E., shifted in 20 minutes to E. N. E., and blew very heavy for nearly an hour. A calm of half an hour succeeded, and the wind then shifted to the W. N. W., and blew, if possible, with still greater violence.

At Cape May, N. J., commenced at N. E., at 2 P. M., and veered to S. E and blew with violence. After abating 15 minutes, it again blew with increased violence for two hours, and then abated. The sun set clear, with pleasant weather, at which time not a cloud was to be seen in the western horizon.

At Bombay Hook, near the mouth of the Delaware River, the gale blew from N. N. E. to W. N. W.

At sea, 40 miles N. E. of Cape May, the gale was at S. E., and lasted 8 hours.

At Philadelphia, the storm commenced at 1 P. M. on the 3d, from N. to E., and raged with great violence from N. E. to N. W., during the greater part of the afternoon.

At Trenton, N. J., the gale commenced at 3 P. M., with the wind from N. E.

In lat 39° 20′, lon. 73° 30′, the gale blew from E. S. E. to S. S. E., and continued 8 hours.

At New York, the gale was from N. E. to E., and commenced blowing with violence at 5 P. M., continued with great fury for three hours, and then changed to W. More damage was sustained in 2 hours than was ever before witnessed in the city, the wind increasing during the afternoon, and at sunset was a hurricane. At the time of low water, the wharves were overflowed, the water having risen 13 feet in one hour. Previous to the setting in of the gale, the wind was from S. to S. E., but changed to the N. E. at the commencement of the storm, and blew with great fury till evening, and then shifted to the westward.

At the quarantine, Staten Island, the wind was reported as E. S. E. Other accounts fix it at E.

At Bridgeport, Conn., the gale commenced violently at S. E. at 6 P. M.,

and continued till 9 P. M., then shifted to N. W., and blew till nearly 11 P. M.

At New London, the gale was felt from 7 P. M. to 12 at night.

On the coast of Rhode Island, between Point Judith and Watch Hill, gale from the S.

At Middletown, Conn., violent from S. E. for 5 hours.

At Hartford, commenced heavy from S. E. at 7 P. M.

At Springfield, Mass., violent from 9 to 12 P. M., then changed to the westward.

At Northampton, from S. E. on the same evening.

At Worcester, Mass., in the night between the 3d and 4th of Sept.

At Boston, the gale commenced at 10 P. M., but does not appear to have been severe.

At the time the storm was raging with its greatest fury at New York, the citizens of Boston were witnessing the ascent of a balloon, and the æronaut met with little or no wind. The general course of this storm, northward of Cape Hatteras, appears to have been from S. S. W. to N. N. E., and of its further progress we are uninformed.

It appears, from the foregoing statement of facts, that this storm, previous to its reaching Long Island, extended but a moderate distance inland, and that its influence seaward from the east, was almost equally limited; that between these boundaries it maintained a regular progress along the coast from a great distance towards the south, and probably even in the neighbourhood of the West India Islands;—that this progress, though slower in the lower latitudes, was, after reaching the American coast, at a rate not greatly differing from 30 geographical, or nautical, miles per hour, which is presumed to have been nearly the velocity of the direct southerly current prevailing in the atmosphere at that time, at a medium height from the surface at this rate of progression, appears to have governed the duration and termination of the storm at each place over which it passed—that on the western margin, or verge, of the storm, or at those places most distant from the sea, the wind was north-easterly or northerly, while on the opposite verge, at sea, the wind was southerly and westerly;—that along the central portion of the tract, the storm was violent from the south-eastern quarter, *changing suddenly to an opposite direction;**—and that there was previously and subsequently no prevalence of an easterly wind, nor was there any other apparent cause for a direct movement of the atmosphere from that quarter; all the existing tendencies being in another direction. The centre of the storm, or hurricane, appears to have been generally outside the coast, till, reaching Long Island, it crossed the same, and entered upon the state of Connecticut. It seems also to have passed westward of New Haven, and to have entered the valley of Connecticut river near Middletown, and after partially following that valley for some distance, and crossing the state of Massachusetts, the storm must have disappeared towards the eastern coast, and its further progress does not appear to have been reported. The general analogy or correspondence of the foregoing facts to the known phenomena of whirlwinds and tornadoes, will, it is believed, be sufficiently evident, at least so far as the difference in the magnitude and other circumstances of these rotative masses will permit of the resemblance."

* It is remarkable that not one instance is to be found in this storm in which the wind changed suddenly round to N. W., where it set in from S. E. (See p. 149. 4th.)

Facts collected by Mr. Espy, taken from the newspapers of the time.

Aurora, Sept. 10, 1821.

Norfolk, Sept. 4th.

Among the rest of our misfortunes, we are grieved to state that our town was visited on *yesterday* by a storm or tornado, &c. The morning was dark and gloomy, at 6 o'clock rain began to fall in torrents. At 10 it abated a few minutes, and then came again with increased violence, and the wind commenced blowing a heavy gale from the N. E., and continued to increase to an alarming height. From 11½ to 12½ o'clock, the fury was such as to threaten a general demolition, &c. About 12, the wind shifted to N. W., and continued its fury until half an hour after, and the storm began to subside. At 4 o'clock, the wind changed to S. W., and the weather became calm.

New York, Sept. 4th.

From Saturday (the 1st) till 4 o'clock, we were visited with repeated showers, accompanied with thunder and lightning. The wind veered and shifted to almost every point.

National Intelligencer, Sept. 8.

At New Haven, the gale commenced at 6 P. M., and from 8 to 10 increased to a violent tornado.

National Intelligencer, Sept. 10. Steamboat Norfolk left Baltimore on the 3d, at 9½ A. M., wind at the time light N. W., with rain. At 2 P. M., off Poplar Island, about half way from Baltimore to the mouth of the Potomac, commenced a most tremendous gale from N., with heavy rain, which continued to increase in violence till 4, when it moderated, and at 12 at night, off the mouth of the Potomac, took in tow the ship Repeater, which had left Annapolis at 3 A. M., and at 2 P. M., near Point Look Out, was obliged to cut away all her rigging, the wind blowing a heavy gale from N. E.

National Intelligencer, Sept. 12. Capt. Crabtree, 25 leagues to the S. by E. of Cape Hatteras, says, that on the night of the 2d, a violent gale came on to blow from E. S. E., and began to abate at noon of the 3d. The Franklin Gazette, Philadelphia, says the wind at New York had been S. and S. E. most of the day, but between 4 and 5 it changed to N. E., and blew until near 7 with great violence. About that hour the wind abated, and soon after shifted to W. N. W.

Sept. 6, same paper. Steamboat Connecticut at New Haven, had the wind first from E., but at 10½ o'clock it got round to S. Sept. 7, at New Brunswick, tremendous storm from N. E., with torrents of rain in P. M.

National Gazette, Sept. 8.

Capt. West, of the ship Tuscarora, got under weigh from New Castle at 7 A. M., wind N. E. About 10, came on to blow fresh, with very thick weather and much rain. At 11, came to anchor in Bombay Hook Roads. The wind and rain increased to a violent gale. About 3 began to drift. The wind commenced N. E., and the strongest was from N. At 6 it veered to N. W., moderated and cleared up.

Same paper, Sept. 10. Schooner Gen. Green, between Capes Sable and Ann, had a strong breeze, but no gale, though every vessel in Quarantine Roads (Boston) dragged anchor.

Freeman's Journal, Sept. 8.

Schooner Swan, in lat. 39° 20′, (Evening Post, of 7th, says lat. 36° 20′) lon. 73° 30′, encountered the hurricane, which continued for 8 hours, E. S. E. to S. S. E. Also sloop Regulator, in lat. 38° 30′, lon. 74° 30′, experienced

experienced a tremendous gale from S. by E., and lay to 10 hours. At Huntingdon, L. I. at 7 P. M., we were visited by a most tremendous gale of wind from the N. E.

Freeman's Journal, of Sept. 11. Ship Repeater, near Point Look Out, had wind from N. E. From 12 to 2 a most violent gale. (Delaware Bay.)

Freeman's Journal, Sept. 11. Schooner Rising States, 2 days from Charleston towards New York, had a violent gale which lasted 6 hours, from S. E. to W. S. W.

New York Evening Post, Sept. 4. The gale at Jersey City was from N. E., accompanied with hail and rain, which fell in torrents.

Sept. 5. At Quarantine, the commencement of the gale was E. S. E.

Sept. 10. Schooner Polly and Sophia, 40 miles N. E. of the Capes of the Delaware, experienced a most tremendous gale from the S. E., which lasted eight hours.

American Daily Advertiser, Sept. 6. From New York of Sept. 4. About 4½ P. M., yesterday, the wind came out from about E., with all the fury of a hurricane, and continued till about 8½ P. M.

Sept. 7. From Norfolk paper of the 4th. Yesterday, between the hours of 10 A. M. and 1 P. M., our town was visited by a hurricane, accompanied by torrents of rain, commencing from N. E. and terminating at N. N. W. Also, from the Bridgeport (Conn.) Farmer. After 2 or 3 days of dull cloudy weather, with frequent heavy showers, we were, on Monday evening, (3d) visited by the most dreadful hurricane which has been experienced for many years. The wind commenced blowing hard from S. E. about 6 P. M., accompanied with rain, and continued to increase in violence till about 9 P. M., when the tempest raged with a degree of fury the most awful and destructive. The storm continued with unabated force until near 11 P. M., when the wind hauled round to S. W., and gradually subsided.

Also, in a letter from New Haven, by a gentleman who left there at 6 P. M., in steamboat Connecticut: "As we approached the light house at the harbour's mouth, the wind, which had been blowing very hard, became violent, and we anchored in the Cove, between the Fork and light house. The gale kept increasing, and our vessel dragged her anchors, in spite of a great scope of cable and the assistance of the engine. Suddenly the wind shifted to S. W., and blew a perfect hurricane. Also, from New York American, Sept. 3d, 1821. In the early part of the day, and at intervals till late in the P. M., heavy showers, with steady breezes from the S. E. From 5 to 6 P. M., the wind and rain increasing, with every indication of a settled storm. From 6 to about 7h. 30m., P. M., the wind E. S. E., but varying to E. and E. N. E., accompanied with rain; blew with extreme violence. From 7h. 30m. to 8 P. M., the wind had much abated; it then veered round to the S. W., and the clouds were swept away with astonishing quickness. Bar. lowest at 7.30—29.34, having been in the mor. at 6h. 30.13 inches.

Poulson, Sept. 10. Dennis' Creek. On the 3d inst. the wind came on to blow about 2h. from the eastward, and continued to increase until about 5 P. M. At about 5, the wind changed to the westward, still blowing very heavy (near Goshen Creek and Maurice River.) Poulson, Sept. 5, at Philadelphia, a storm of rain commenced about 1 P. M. on the 3d, accompanied with high wind, which increased almost into a tornado in P. M. The wind was generally from N. to N. E., during its greatest fury, but varied occasionally to almost every point of the compass. . . . . Much damage was done at the Navy Yard, by the violence of the gale during its rage from the N. E. and N. W.

Poulson, Sept. 8. Mr. Guille ascended in his balloon at 4h. 45m., at Boston, and sailed towards the N. W. Sept. 10. On Monday night, 3d, a short but severe gale from the S. E, did considerable damage to the trees and fruit in that vicinity; and at Worcester, Mass., the gale commenced at 9 P. M., and increased till midnight; and at Middletown lasted 5 hours; and the New York Evening Post of Sept. 7, says that this gale at Middletown was from S. E., commencing about 9 P. M., and at Boston at 10 P. M. And the same paper says that the rains were very great at Baltimore and Annapolis.

National Gazette, Sept. 6. The gale of 3d Sept. was almost a hurricane at Bombay Hook for about an hour, from N. E. to N. N. W.

Sept. 7. At Cape May, from 1 P. M. till half past 4, the wind blew a violent hurricane S. E. Hugh's large house had the piazza blown off.

Freeman's Journal, Sept. 11. At Annapolis, at 4 A. M., wind W. N. W. and rainy. At the mouth of the Patuxent, at 11h. 30m., gale increasing and inclining northward. At Point Lookout, still inclining to N. E., and at 2 P. M. very violent N. E. At 6 P. M. the gale had abated.

Same paper, Sept. 12. About 5 miles below Reedy Island, at noon, the wind hauled to N. E. from the S. E., and hauled round to N. N. W., blowing a heavy gale. (Delaware Bay.)

Same paper, Sept. 15. Brig Panopea, 75 miles S. by E. from Cape Hatteras. It came on to blow a gale from E. S. E. on the night of the 2d. On the 3d, at noon, the gale began to abate. Also, the Atalanta, off Cape Hatteras, experienced a severe gale from S. E. At Ocracoke, at daylight, wind E. S. E., blowing a gale; after hauling round to S. S. W., ceased between 10 and 11 A. M., both at Ocracoke and Portsmouth.

To the Joint Committee. J. P. Espy.

I will now add, that the reader will perceive, by a careful examination of all these facts, that all the generalizations given above are fairly deduced—and that they all, when combined, form a most satisfactory demonstration of the theory advocated and developed in the preceding papers. Moreover, as the wind on the S. E. side of the storm had been blowing all day, before the storm came on, from the S. E., and on the N. W. side of the storm from the N. W., there appears no reason for the motion of the storm from the S. W., but the uppermost current of the atmosphere, which is known to be almost always moving in this direction.

Date. 1821.	Thermometer.			Barometer.			Rain.	Wind.		Weather.		
	Sun rise.	2 P.M.	10 P.M.	Sun rise.	2 P. M.	10 P. M.	inches.	Sun rise.	2 P.M.			
Sept. 1	70	82	73	30.02	30.03	30.02	.78	S.	S.	Cloudy.	Broken R.	Cloudy
2	70	78	71	.02	29.97	29.97	.62	S.	S.	do. R.	Cloudy R.	do.
3	70	80	70	29.97	.92	.47	.72	S.	S.E.	do. R.	do.	do.
4	68	73	68	.90	.85	.81		S.		Broken	do.	do.
5	62	75	62	.73	.74	.76		W.	S W.	Clear.	Clear.	Clear.

"On the evening of the 3d, between 7 and 12 P. M., the most violent storm of wind occurred that has happened since 1815." During the evening, Mr. Herrick thinks the wind was from S. E. to S.

These observations, made at New Haven, Connecticut, are furnished by Charles Rich, Esq. of that place.

Philadelphia, March 13th, 1839.

(TO BE CONTINUED.)

A Plan proposed by Capt. F. BEAUFORT, *Hydrographer of the British Admiralty, for Improving the manner of keeping the Log on board of Vessels at Sea.*

Capt. Beaufort has suggested the following plan for keeping the log on board of vessels at sea, viz:

1st. The state of the weather to be denoted by letters of the alphabet, 18 in number, each letter showing the variety.

2nd. The force of the wind to be denoted by figures; 13 degrees to be used, beginning with *calm* and ending with *hurricane*. Each figure to denote a degree.

It will only be necessary to rule the log-book with two columns, one for each class.

Much space, time, and labor will be saved, and much valuable information gained and preserved by an adoption of this method of recording observations.

V.

1st Column to Record the force of the Wind.

0	denotes	Calm.		
1	"	Light Air.—just sufficient to give steerage way.		
2	"	Light Breeze,	with which a well-conditioned man-of-war, under all sail and clean full, would go, in smooth water, from	1 to 2 knots.
3	"	Gentle Breeze,		3 to 4 knots.
4	"	Moderate Breeze,		5 to 6 knots.
5	"	Fresh Breeze,	in which the same ship would just carry, close-hauled.	Royals, &c.
6	"	Strong Breeze,		Single reefs and top-gallant sails.
7	"	Moderate Gale,		Double reefs, jibs, &c.
8	"	Fresh Gale,		Triple reefs, courses, &c.
9	"	Strong Gale,		Close reefs & courses.
10	"	Whole Gale,	in which she could only bear,	Close-reefed main topsail and reefed foresail.
11	"	Storm,	with which she would be reduced to,	Storm stay-sails.
12	"	Hurricane,——to which she could shew——No canvass.		

If the above mode of expression were adopted, the state of the wind, as well as its direction, might be regularly marked, every hour, in a narrow column on the log-board.

2nd Column to Record the state of the Weather.

b	denotes BLUE SKY.—Whether with clear or hazy atmosphere.
c	CLOUDY.—i.e. Detached opening clouds.
d	DRIZZLING RAIN.
f	FOG.—Thick fog.
g	GLOOMY DARK WEATHER.
h	HAIL.
l	LIGHTNING.
m	MISTY OR HAZY.—So as to interrupt the view.

o denotes OVERCAST.—i. e. The whole sky covered with one impervious cloud.

p PASSING SHOWERS.

q SQUALLY.

r RAIN.—i. e. Continuous rain.

s SNOW.

t THUNDER.

u UGLY THREATENING APPEARANCE IN THE WEATHER.

v VISIBILITY OF DISTANT OBJECTS.—Whether the sky be cloudy or not.

w WET DEW.

• Under any letter denotes an EXTRAORDINARY DEGREE.

By the combination of these letters, all the ordinary phenomena of the weather may be recorded with certainty and brevity.

Examples.

d e m Blue sky, with detached opening clouds, but hazy round the horizon.

g v • Gloomy dark weather, but distant objects remarkably visible.

g p d l t • • Very hard squalls, and showers of drizzle, accompanied by lightning, with very heavy thunder.

Civil Engineering.

CONVENTION OF CIVIL ENGINEERS OF THE UNITED STATES.

Proceedings of the Convention of Civil Engineers, for the formation of a Society of Civil Engineers of the United States. Held in Baltimore, Maryland, February 11, 1839.

In pursuance of a call from Augusta, Ga., a meeting of civil engineers was held at Barnum's Hotel, in the city of Baltimore, on Monday, February 11th, 1839.

On motion of Mr. J. Edgar Thomson, of Georgia, Isaac Trimble, Esq., of Baltimore, was called to the chair.

The chairman having called the convention to order, laid before it the following letter from the curators of the Maryland Academy of Science and Literature.

"TO ISAAC TRIMBLE, Esq.,

Dear Sir:—The undersigned having been informed that a number of gentlemen, from various parts of the Union, are now in the city, for the purpose of forming an Association of Civil Engineers, beg you, in the name of the Academy, to offer their rooms for the use of the gentlemen interested in a project so intimately connected with the advancement of science.

Yours, with great respect,

JAMES GREEN,

For the Curators of the Maryland Academy of Science and Literature."

Whereupon, on motion of Mr. C. O. Sanford, of Virginia, the convention adjourned, to meet at that hall, to-morrow morning at 11 o'clock.

HALL OF THE MARYLAND ACADEMY OF SCIENCE AND LITERATURE,

11 *o'clock, Tuesday, February 12th*, 1839.

The convention met according to adjournment, forty gentlemen of the profession being present, from the States of Massachusetts, New York, New Jersey, Pennsylvania, Illinois, Maryland, Virginia, Missouri, North Carolina, Georgia and Louisiana.

The convention being called to order by the chairman of yesterday, Mr. J. F. Houston, of Pennsylvania, was appointed Secretary.

The chairman then read a letter from Wm. G. McNeill, Esq., expressing regret at not being able to be present at the meeting of the convention.

A letter of similar import from Jonathan Knight, Esq., was read by Mr. Latrobe.

The chairman having announced that the convention was prepared to go into election, on motion of Mr. Miller, Mr. Latrobe was unanimously chosen President.

The President having announced that the convention was organized, Mr. Kneass offered the following resolutions:

1. *Resolved*, That the convention now proceed to the election of a committee of *seventeen*, to prepare and adopt a constitution, and form a Society of Civil Engineers of the United States.

2. *Resolved*, That the committee meet at the Hall of the Franklin Institute, in Philadelphia, at such time as they may deem convenient; and that five of them shall constitute a quorum for the transaction of business.

The first resolution being before the convention, Mr. Pickell proposed the following amendment, to be added;

"And that in the selection of the members of the committee, not more than *two* be taken from each State or Territory in the Union."

At the request of Mr. Sykes, Mr. Pickell withdrew his amendment, to give way to an amendment by Mr. Trimble, which was "to strike out the number *seventeen* and insert *ten;*" which was lost. The yeas and nays being called for, stood yeas 14, nays 22.

Mr. H. A. Wilson then proposed to amend by "striking out *seventeen* and inserting *five;*" which amendment was lost.

Mr. Trimble moved to amend by "striking out *seventeen* and inserting *twenty;*" which was also lost.

Mr. Pickell then renewed his amendment.

Mr. Miller proposed to amend the amendment so as to read;

"And that, in the opinion of this convention, the said committee should be so selected, that all the different portions of the Union may be represented in it, so far as is practicable;"

Which was concurred in, and the amendment so amended adopted.

The question being on the first resolution as amended, it was adopted.

The second resolution being before the convention, an amendment was proposed by Mr. Miller, and accepted by Mr. Kneass, specifying "the second Wednesday in April as the time of meeting."

Mr. Trimble proposed to amend by striking out all after the word "Philadelphia," and inserting, "at as early a day after the adjournment of this convention, as will suit their convenience; and that ten of their number constitute a quorum for business," which amendment was not agreed to.

Mr. Harrison then moved to amend by adding, "but that a majority of the seventeen, expressing their assent by letter or otherwise, be required to adopt the constitution," which was concurred in, and

The question being upon the second resolution as amended, it was unanimously carried.

The convention then went into the election called for by the first resolution, pending which, the convention adjourned to 4 o'clock, P. M.

Afternoon Session.

The President announced to the convention the result of the balloting, being the election of the following gentlemen,

Benjamin Wright,	of New York.
William S. Campbell,	of Florida.
Claude Crozet,	of Virginia.
W. M. C. Fairfax,	of do.
C. B. Fisk,	of Maryland.
Edward F. Gay,	of Pennsylvania.
Walter Gwynn,	of North Carolina.
J. B. Jervis,	of New York.
Jonathan Knight,	of Maryland.
Benjamin H. Latrobe,	of do.
W. G. McNeill,	of South Carolina.
Edward Miller,	of Pennsylvania.
Moncure Robinson,	of Virginia.
J. Edgar Thomson,	of Georgia.
Isaac Trimble,	of Maryland.
Sylvester Welsh,	of Kentucky, and
G. W. Whistler,	of Connecticut.

It was then, on motion of Mr. S. W. Roberts, unanimously resolved,

"That in recording the minutes of the proceedings, the secretary be directed to place the name of Benjamin Wright, at the head of the list of the committee, he having been elected by an unanimous vote of the convention; and that the names of the other gentlemen be made to succeed in alphabetical order."

Mr. Kneass laid before the convention the following letter from the President and Managers of the Franklin Institute of Pennsylvania.

HALL OF THE FRANKLIN INSTITUTE,
Philadelphia, January 2d, 1839.

"TO BENJAMIN WRIGHT, WILLIAM STRICKLAND, SAMUEL H. KNEASS, E. H. GILL, Esquires, and other Civil Engineers.

Gentlemen:—Your communication* of the 24th ult., addressed 'to the President and Managers of the Franklin Institute of the State of Pennsylvania,' was read at a special meeting of the Board of Managers, held on the 31st ult., and was referred to a committee consisting of the undersigned, who were instructed to confer with you, in relation to the project, entertained by you, of forming an 'Institution of American Civil Engineers.' The committee were authorized to take order on the subject referred to them; and to express the anxious desire of the Institute to promote any

* TO THE PRESIDENT AND MANAGERS OF THE FRANKLIN INSTITUTE OF PENNSYLVANIA.
Philadelphia, December 22d, 1838.

GENTLEMEN,—A meeting of engineers having (by a circular from Augusta, Georgia, dated December 17th, 1838,) been called in Baltimore, Maryland, the *second Monday in February next*, for the purpose of forming an Institution of American Civil Engineers, and the undersigned being of opinion that such an institution if attached to the Franklin Institute would prove beneficial to that institution, while the primary

plan, that might appear to you best calculated to insure the success of your undertaking.

"After the free conference, which our committee had yesterday, with several of your number, we think we will best attain the objects you had in view in your application, and best consult the wishes of our own Board, by the following answer to your letter:

"Should the Civil Engineers of the United States concur in the formation of a society such as you propose; and should they decide to meet in this city, the Franklin Institute will agree:

"1st. To furnish them all the accommodations they may desire, for the meetings of their society, or of its committees, and for their collections of books, drawings, models, &c. The details of this arrangement will be entered into, whenever it is known what extent of accommodation may be required, and a joint committee of the two bodies will have power to carry into execution all the regulations, in regard to the arrangement, disposal, and care of your books and collections, which your society may adopt.

"2d. The Franklin Institute will authorize their Actuary to accept any appointment, as secretary and treasurer, librarian, or curator, which the Society of Civil Engineers may choose to bestow upon him. Any arrangement made by the Society with the Actuary, which will be satisfactory to

objects of the other would perhaps be more speedily accomplished by such a connexion, on account of the Institute having already the buildings, and also a good library on engineering: are led to propound to you the following queries.

Should an Institute of Engineers be formed, would the Franklin Institute furnish suitable accommodations?

Would the Actuary of the Franklin Institute be permitted to act as Secretary and Treasurer to the Institution, and take charge of the books and documents, if he were willing to accept the office for a suitable compensation?

If the convention at Baltimore, or any subsequent one, should desire, would the Managers of the Franklin Institute admit the members of the Institution of Civil Engineers into their institution as an adjunct association, with liberty of secession, if it should subsequently appear that the objects of the Engineers' Institute could not be thus attained? And could the Managers by law make such a union effective under their charter, and upon what conditions?

Finally, as the object of this communication is to obtain from the Managers of the Franklin Institute their views upon the formation of an association likely to be of such advantage to science and the arts, (the same cause in which you are engaged,) as it is confidently expected an institution of Civil Engineers will prove to be, the undersigned would feel themselves obliged to the Managers of the Franklin Institute for any suggestions calculated to advance the prosperity of the Institution they have in contemplation, and which, from the experience of the Managers of the Franklin Institute, it appears to the undersigned they are well qualified to give.

Very respectfully,

BENJAMIN WRIGHT,
WILLIAM STRICKLAND,
SAMUEL H. KNEASS,
E. H. GILL,
H. R. CAMPBELL,
ELLWOOD MORRIS,
C. O. SANFORD,
W. MILNOR ROBERTS,
W. H. WILSON,
EDWARD MILLER,
S. W. ROBERTS,
ASHBEL WELCH,
E. A. DOUGLAS,

Civil Engineers.

both, will be concurred in by the Institute. Should the duties thrown upon him, as the executive officer of the new society, consume too much time, he may (while he remains the responsible officer of both institutions) take such assistants, as may be necessary.

"3d. The Journal of the Franklin Institute will be open to the Society of Engineers, as a vehicle of information to their scattered members; and the committee on publications will cheerfully avail themselves of the privilege of selecting, for publication in our Journal, any memoir of interest, or any communication which you may not be able to include in your annual volume of Transactions.

"4th. Should the society of engineers deem it desirable, to entrust any part of their business, such as the selection of materials for their transactions, or the superintendence of their publications, to a committee of the managers of the Franklin Institute; such a committee will be appointed by our Board, and will freely give you any assistance, advice and services, that may be required.

"The charter, under which the Franklin Institute is organized, is one of a most liberal character. The objects of the corporation are stated to be (among other things) the promotion and encouragement of the useful arts, by all such measures, as they may deem expedient, and the corporation has all the powers necessary to justify the adoption of any measures, conducive to the objects of your society, which you may be disposed to request of them.

"We have pleasure in adding, that admittance to our rooms and collections, and, indeed, all the privileges of membership are cheerfully extended, on all occasions, to strangers visiting our city, and that therefore any engineers, arriving here, would be always welcome visiters at the Franklin Institute.

We know the views of our Board, and feel ourselves authorized to pledge to you the fullest and most friendly co-operation on the part of the Institute, should you select Philadelphia as the location of your society."

William H. Keating,
Samuel V. Merrick,
John C. Cresson,
Robert M. Patterson,
Charles B. Trego. } *Committee.*

Whereupon, on motion of Mr. Griffin, it was resolved, that the thanks of this convention be tendered to the President and Managers of the Franklin Institute, for their liberal proposition.

Mr. Roberts then introduced the following resolution:

Resolved, "That the thanks of this convention be tendered to the Maryland Academy of Science and Literature, for their courteous offer, to the convention, of their rooms in Baltimore,"—which was unanimously concurred in.

Mr. Trimble then moved, that the President be requested to notify the members of the committee, not present at the convention, of the proceedings; which motion was adopted.

On motion of Mr. Thomson, of Georgia, it was *Resolved*, That the President appoint a committee of five to draft an address to the Civil Engineers of the United States, and to superintend the publication of such portions of the proceedings of this convention as they may deem expedient. The President appointed Messrs. Fisk and Trimble, of Maryland, S. W. Roberts,

of Pennsylvania, J. B. Jervis, of New York, and G. W. Whistler, of Connecticut.

Mr. C. O. Sanford then moved, that the thanks of this convention be tendered to the chairman of the preparatory meeting, and to the President and Secretary of the convention, for the able and efficient manner in which they have discharged their duties; which was concurred in; and the convention adjourned sine die.

BENJAMIN H. LATROBE, *President.*

John Frederick Houston, *Secretary.*

Address of the Committee appointed at the Convention of Civil Engineers, which met in Baltimore, February 11, 1839.

At a Convention of Civil Engineers of the United States, which met in Baltimore on the 11th of February last, in pursuance of a call from a highly respectable meeting of members of the profession in Augusta, Geo., the following resolution was adopted.

Resolved, That the President appoint a Committee of Five to draft an address to the Civil Engineers of the United States, and to superintend the publication of such portions of the proceedings of this Convention as they may deem expedient.

The President appointed Messrs. Fisk and Trimble, of Maryland, S. W. Roberts, of Pennsylvania, J. B. Jervis, of New York, and G. W. Whistler, of Connecticut. Mr. Whistler having declined the appointment in consequence of his inability to attend, Mr. Edward Miller, of Pennsylvania, was subsequently appointed in his place.

A majority of the Committee met, according to appointment, at the Hall of the Franklin Institute, in Philadelphia, on the 20th of March, 1839, and adopted the following address.

ADDRESS.

The Committee believe that they will best perform the duty assigned to them, of preparing an address to their professional brethren upon the subject of the proposed Society of American Civil Engineers, by confining their remarks to what they deem the objects and advantages of such an institution.

Forty members of the profession, from eleven states of the Union, composed the Convention at Baltimore, and a number more expressed, through their friends who were present, their approbation of the object in view, and their regret at being unable to attend.

The principal business transacted by the Convention was the election of seventeen Engineers, from different parts of the Union, as Delegates to frame a Constitution and form a Society. The time fixed for this meeting was the second Wednesday in April next, and the place the Hall of the Franklin Institute, in Philadelphia.

A gratifying degree of unanimity characterized the proceedings of the Convention, and a confident hope was generally expressed that the Delegates (many of whom were not present) would form a Society, the obvious utility of which would secure its perpetuation.

Public works are now so extended in our country, and the mass of experimental knowledge to be gained from those in use is so great and so peculiarly applicable to our circumstances, that it is even more valuable to

the American Engineer than what he can learn in Europe, where larger means have permitted greater expenditures. In this country, it is of paramount importance to obtain the greatest amount of useful effect at the smallest cost; and of attempts to attain this end, the Union now contains a multitude of instructive examples. Some have been eminently successful, and others less so; but of either kind, the student, or the more advanced Engineer, too often seeks in vain for any satisfactory written or printed description, and is unable to obtain any thing more than vague, doubtful, and incorrect information. This evil can only be removed by the exertions of the Engineers themselves.

They are now established as a distinct class, and have long felt the want of such an association as that proposed, but it has hitherto been supposed that the proper time for its organization had not yet arrived.

The success that has attended the labours of the London Institution of Civil Engineers, its high standing and great usefulness, prove that such societies may be of great public utility, when properly conducted, and are incentives to induce us to imitate so excellent an example.

It is admitted, however, that a society in this country must differ somewhat in its plan of operations from the British Institution, which can readily give utterance to its opinions elicited after frequent and full discussion, since a large portion of its members during the winter, have their residences within the limits of London. Here, however, owing to the vast extent of territory over which are scattered the members of our profession, the usefulness of the Society must (for the present at least) depend more upon the facts and experience of its members, made known in written communications, than upon their opinions orally expressed in public discussions.

The very fact that our improvements are so widely spread, that few, if any, members are able to give even the most important of them a personal examination, affords, perhaps, the strongest argument in favour of a society that shall, by a concert of action, bring the experience of the whole country within the reach of each member.

The difficulty of meeting at any one point, caused by the time and expense required in traveling from distant portions of so extensive a country as the United States, is a serious obstacle, but it has been much diminished by the facilities afforded by the rail-roads already in use, which are among the valuable results of the labours of our Civil Engineers.

Though our Society may be less favourably situated than the one in London for frequent and public discussion, we nevertheless anticipate many important advantages to be derived from a personal intercourse and interchange of information among its members, and from the establishment of a permanent repository of the results of experience, obtained from the most authentic sources.

The standing of the profession in our country is, fortunately, such that its importance need not be dilated upon; it is, therefore, the more necessary that every thing in the power of the members should be done to add to its respectability and increase its usefulness. We look forward to the formation of the Society as a valuable means of advancing these desirable ends.

We think that the preliminary steps have been well taken; and as the late Convention has given the whole matter into the hands of the seventeen Delegates who were elected to frame the constitution and form the Society, we hope that each of those gentlemen will feel that an important and complimentary trust has been reposed in him, and exert himself to fulfil it in

such a manner as to advance the permanent interest of the profession of which he is a member.

We trust, also, that each may appreciate the importance of attending at the time and place appointed for forming the Society, and will be willing to make some sacrifice for effecting that object; or if prevented from attending by uncontrollable circumstances, that he will express his views in writing upon the subject of a suitable constitution.

The Committee will close this address by a quotation from the inaugural address of the distinguished Thomas Telford, the first President of the London Institution, which appears to them peculiarly appropriate.

"In foreign countries similar establishments are instituted by government, and their members and proceedings are under its control, but here a different course being adopted, it becomes incumbent on each individual member to feel that the very existence and prosperity of the institution depends, in no small degree, on his personal conduct and exertions; and the merely mentioning the circumstance will, I am convinced, be sufficient to command the best efforts of the present and future members, always keeping in mind that *talents and respectability are preferable to numbers, and that from too easy and promiscuous admissions, unavoidable and not unfrequent incurable inconveniences, perplex most societies.*"

Signed by order of the Committee.

CHARLES B. FISK, Chairman.

Sixth Annual Report to the Building Committee of the Girard College for Orphans. By THOMAS U. WALTER, *Architect.*

GENTLEMEN—

In conformity with your Resolution of the 5th instant, I have the honour to lay before you the following Report on the progress of the work during the past year.

The arches over the rooms in the third story of the main building are entirely finished,—the marble work of the *cell* is completed,—the columns and architraves of the south vestibule, to the third story rooms, are erected and prepared to receive the vaulting to support the roof,—and those of the north vestibule are so far advanced as to admit of their being completed during the winter. The centres are all prepared for these vestibules, so that the arches may be constructed early in the ensuing season.

The centres, or supports upon which the third story arches were formed, have been removed,—those in the second story are freed from the brickwork, and the workmen are now engaged in taking them out,—and those in the first story were removed in the early part of the season:—we have, therefore, the satisfaction to know that all the large arches are completed, and are now standing independent of the supports upon which they were constructed, without having produced the slightest fracture or settling in any part of the building. I am induced to make these remarks from the fact, that the great length of the *chord* of the arches in the first and second stories, compared with their small *versed sine*, led many to doubt the possibility of making them permanent. Although such apprehensions were most certainly never indulged by those who are conversant with the theory of arches, it still becomes necessary for me to lay the result before you, as the subject was one that was freely discussed in the early part of the work.

It will also be proper for me here to advert to the mechanical construction

of these arches;—they are all composed of hard burnt paving bricks, and mortar made of lime, hydraulic cement, and sharp sand:—the bricks were all dipped in water before they were laid, and the mortar was used in very small quantities, few of the joints being more than one-eighth of an inch in thickness:—the keys are all formed of marble, and were fitted to their places by the stonecutters after the completion of the brickwork; these keys are four inches wide at the bottom and six inches at the top. Notwithstanding the versed sine of these arches is but eight feet and a half, while they each cover a room of fifty feet square, and contain 117,000 bricks, the weight of which is nearly *three hundred tons*, there was no sinking at the crown of any of them, when the centres were removed, beyond one-eighth of an inch. It was naturally expected that the compressibility of the materials would cause considerable depression, but the excellence of the workmanship has produced an unusual firmness in the work, which reflects great credit upon the superintendent under whose directions it was executed.

The arches over the rooms in the third story being unrestricted as to height, I have given them the form of pedentive domes with semi-circular sections: these arches are constructed with the same degree of care and accuracy as those in the lower stories, and their appearance since the centres have been removed, fully realizes our expectations.

All the columns, on both the flanks, have been commenced; four on the eastern side have been raised to their destined height; one is ready to receive the capital, and three have their architraves upon them; nearly all the marble required for the eastern colonnade is wrought, and the whole will be completed during the winter, so as to be ready to be put together as soon as the spring opens.

A sufficient number of column blocks are prepared to complete seventeen columns, including what are already finished: twelve capitals are entirely completed, and six more are in progress of execution, most of which require very little work to finish them.

There are nineteen architraves on the ground for the exterior portico, besides the two that are placed in their destined situation.

The interior of the out buildings, on the east of the College, have been as nearly completed as may be desirable until Councils decide upon the time for opening the institution. These buildings are so far advanced as to admit of being prepared for occupancy at two or three weeks' notice.

The quantity of marble delivered during the past year, amounts to 35,027 cubic feet.

There are now remaining on the ground, exclusive of the wrought and unwrought materials for the exterior porticoes before alluded to, about 1,600 feet of finished work, 3,040 feet of sawed material, and 1,700 cubic feet of marble in the rough.

The number of bricks left on hand from the previous year amounted to 162,000; since which we have purchased 2,300,150, making 2,165,150; of which 2,075,150 have been used in the building, leaving 90,000 now on the ground.

It is due to the superintendents of all the mechanical branches to say, that the execution of every part of the work continues to merit the highest commendation;—the contracts have been faithfully performed, and nothing has occurred to mar the harmony that has always prevailed on the work, or to impede its progress in the slightest degree.

The expenditures from December 31st, 1837, to December 31st, 1838, amount to $229,937.

The wrought and unwrought materials now on the ground, and which have not yet been used in the building, are worth about $125,000, all of which will be available for the work of the ensuing season.

We have again covered the main building with a temporary roof, and have taken great care to prevent injury from frost; the furnaces have also been put into operation, by means of which every room in the building is kept continually warm.

The precautions that have been used to prevent the arches from being saturated by rain during the execution of the work, and which were spoken of more fully in my last annual report, together with the introduction of heated air by means of the temporary furnaces, have had the effect already to render the walls of the first and second stories perfectly dry: we may therefore proceed to finish these rooms without delay, as no difficulty need be apprehended from dampness.

The main building having advanced so far towards completion, and the two eastern outbuildings being virtually finished, I would respectfully suggest the propriety of extending the work at an early day, so as to embrace all the principal objects that will require to be completed previous to the full organization of the College. The most important of these are, *the two western outbuildings,—the wall to enclose the College grounds, with the lodges and gates of entrance,—and the arrangements for supplying the establishment with water;* which, according to our present plan, will include *a laundry, drying room, ironing rooms, &c.*

As regards the western outbuildings, their foundations may be laid, and the walls carried up as high as the top of the basement in the next season, without interfering at all with the rest of the work; the quantity of marble they will require will be but small, and that will be but plain ashlar. These buildings will require three years to complete them; I therefore think it important to commence them at once;—the expense of progressing as far with them as I have proposed will not exceed $20,000.

The wall to enclose the grounds, together with the lodges and gates of entrance, constitute another of the subjects I have taken the liberty to suggest for your consideration. It having been decided that the will of Mr. Girard can only be carried out by enclosing the whole forty-five acres, it will become necessary to give early attention to the subject. The whole circuit of the ground is 7,200 cubic feet, and (in the words of Mr. Girard) it must "*be enclosed with a solid wall, at least fourteen inches thick and ten feet high, capped with marble, and guarded with irons on the top;*"—in order, therefore, to conform strictly with these injunctions, and at the same time to make the wall permanent and durable, I propose to lay a course of solid granite, about one foot and a half in height, on a substantial foundation of rubble stone, so as to rise about a foot above the surrounding streets; on this granite base I would construct a brick wall, of fourteen inches in thickness, with buttresses twelve feet apart, projecting nine inches at the bottom, and battering to four inches at the top; on the inside I would build spur piers opposite the buttresses, and crown the whole with a massy marble capping surmounted with irons, as directed by Mr. Girard.

The cost of constructing the wall, as I have here suggested, will be $125,000, exclusive of the gates and lodges, which will cost about $20,000 more.

It would unquestionably be more in harmony with the rest of the architecture, to face this wall with marble; the additional expense of which, for the outside alone, would amount to $100,000; if, however, you should de-

cide to execute this part of the work with bricks, we must depend upon paint for subduing such parts of it as most interfere with the design.

In view of the great extent of this wall, I think it important to make an early beginning; I would accordingly recommend that the granite be put under contract immediately, and that arrangements be made to accomplish about one-fifth of the work during the ensuing season: about $25,000 will therefore be required for this part of the work, should you decide to go on with it as I have here suggested.

The plan for supplying the College with water, is also one of the subjects to which I have ventured to invite your attention. I had the honour to lay before you, in May last, a design for the attainment of this object by means of the water power at Fair Mount, and which I have the satisfaction to say, has been fully approved by the Watering Committee of the City Councils.

Inasmuch as it becomes my duty to furnish you with an estimate of the cost of this part of the work, it will be proper for me here to advert briefly to the plan.

The surface of the ground at the base of the main building being 26 feet above the surface of the water in the Reservoirs at Fair Mount, I found it necessary, in making the plan, to include a reservoir to be placed on the College land, of sufficient height to furnish all the buildings connected with the establishment with a full supply of water under a good head. I have, therefore, designed a building, of three stories in height, to be placed on the highest part of the ground west of Schuylkill Front street; the first and second stories of this building will comprise the laundry, drying room, ironing rooms, &c., and the third story will contain the reservoir.

I then propose to attach a small forcing pump to the northern wheel of the City water works, and connect it, by means of iron pipes, with the reservoir at the College; the power thus obtained will be no detriment whatever to the City works, and will doubtless be ample for all the purposes of the College.

The whole cost of this arrangement, including the building for the reservoirs, &c. at the College, will not exceed $35,000, and it should be remembered, that the only expense will be the first cost of the fixtures, as no additional superintendence will be required at Fair Mount in consequence of an additional pump for the College.

Should you decide to execute this plan, about $15,000 will be required during the ensuing season to prosecute the work.

As there are no means at present for obtaining water, other than those afforded by ordinary wells, it is desirable that arrangements be made forthwith for commencing so important an appurtenance to the establishment.

As regards the amount of work that may be done on the main building in the course of the coming season, I would respectfully say that the flank porticoes may both be completed, all the marble tiles for the roof may be wrought, and the brickwork of the cell prepared to receive them; the finishing of the first and second stories may be progressing, and the marble tiles for the floors, the stairways, and other matters connected with the inside finish, may be put in hand immediately.

To proceed thus rapidly with the main building, about $300,000 will be required for this part of the work alone during the season.

Should you, therefore, desire to forward the whole establishment towards completion, with as much expedition as the present state of the works, and the facilities we now have of obtaining materials will admit, the sum of

$372,000 will be required to prosecute the work during the present year, as follows:

For the two western outbuildings	$ 20,000
For the wall around the premises	25,000
For carrying the proposed plan for obtaining water into operation	15,000
For the main building	300,000
And for completing the two eastern outbuildings, and paying what yet remains due upon them	12,000
Making, as before stated, ...	$372,000

In conclusion, I would only observe, that there will be no difficulty in accomplishing all that I have mentioned before the close of the present year; provided we are informed of your decision at an early day, so as to enable us to make the necessary arrangements for materials previous to the opening of the season.

I have the honour to be, gentlemen, with
great respect, your obedient servant,
THOMAS U. WALTER, Architect.

Girard College, Jan. 21, 1839.
To JAMES HUTCHINSON, Esq.,
Chairman of Building Committee, Girard College for Orphans.

Mechanics' Register.

LIST OF AMERICAN PATENTS WHICH ISSUED IN APRIL, 1838,
With Remarks and Exemplifications by the Editor.

121. For a *Spring Lock for Coach and Rail-road Car Doors;* Peter Alverson, New Haven, Connecticut, April 2.

We are told, by the patentee, that "the object of his invention is a spring lock easily managed, and of sufficient strength to secure the door firmly, and yet in size and form so compact as not to injure the pillar of the door, nor interfere with the run of the lights, and which may be opened and shut from within as well as from without." The lock is then described, but its construction, although not specially recondite, cannot be made clearly known without the drawings.

122. For a *Rotary Steam Engine;* Oliver Wright and A. A. Wilder, Warsaw, Genesee county, New York, April 2.

This engine consists of a thin, revolving wheel, or drum, to the periphery of which steam is conducted through hollow arms within the drum, extending from its centre to its periphery, where it issues tangentially; the improvement claimed is to "the application of springs and set screws to the apertures of rotary steam engines; and also the placing a door to the case so that the apertures may be closed or opened without taking the case apart."

It is not to minor arrangements, of this character, that the rotary engine will owe its utility, should such a debt ever be contracted by it: they may serve to render one rotary engine better than another, but to enable it to

compete with the reciprocating engine requires a radical change, a mode of construction which shall be absolutely new; *possibly* this may be eventually discovered.

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123. For an improvement in *Wardrobe Bedsteads;* Z. C. Favor, Boston, Massachusetts, April 2.

This bedstead is to have the appearance of a wardrobe when turned up; for this purpose there is to be, below the sacking bottom, framed work in imitation of panel doors, whilst swinging doors are dispensed with; there are, however, pilasters hinged to each edge of the front of the case, which turn back to allow of the bedstead being brought down, and which hide the folding legs when it is turned up. The claim is to "the making the under side of the bedsteads to imitate doors in the manner set forth, there being no doors in the improved wardrobe bedstead."

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124. For an improvement in the *Manufacture of Gunpowder;* Richard J. L. Witty, Lowell, Massachusetts, April 2.

(See Specification.)

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125. For an improved mode of *forming raised surfaces for Printing* on paper, Calico, &c.; Godfrey Woone, City of London, April 2.

(See Specification.)

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126. For an improved *Machine for breaking Hemp and Flax;* Alvin Kyes, Crittenden, Grant county, Kentucky, April 2.

An endless chain of slats, or bars, is made to revolve round two rollers, the bars, or slats, forming the bed of the break. Above this is a platform extending the length and breadth of the break, and having on its under sides projecting slats which are to pass in between those of the revolving apron, but so far apart as to span over two of them. This platform is raised vertically by cams, and falls upon the hemp, which is placed upon the bed above described; the claim is to "the so placing of the slats upon the breaker, at such distance apart as that they shall span over two bars of endless chain, whilst the feeding is to the distance of one bar only; the slats thus striking alternately between each bar, as the endless chain is made to advance."

It does not appear to us likely that this simple device will obviate the difficulties which have been encountered, to a greater or less degree, in all the numerous machines for breaking hemp, &c., that have been contrived and patented; not one of which has fully answered the purpose designed.

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127. For an improvement in the *Plaiting Machine for covering Whips;* Seymour Halliday, Westfield, Hampden county, Massachusetts, April 4.

If the reader has ever seen a machine of this kind at work, he will not require an apology for avoiding all attempts at description, its complexity being such as to forbid it. The general construction of this machine is not different from those in general use, the claims being only to certain minor improvements; these claims would not, if copied, convey any distinct idea, even to one conversant with the machine, unless he had the machine itself or the drawing of it before him.

128. For improvements in the mode of *building Ships or other vessels;* Henry Higginson, Boston, Massachusetts, April 4.

In the specification of this patent various improvements are contemplated in ship building, some of which, as will be seen by the claims, are analogous to such as have been essayed, whilst they were believed to be sufficiently different to justify the grant of a patent. It was the intention of the patentee to carry out his plans at an early day, by a practical test, but this has been prevented by his decease, which occurred very shortly after the date of his patent. The claims are of great length, and are as follows:—

Claim.—"Having thus fully described the various improvements made by me, in the manner of building ships, or other vessels, and also, the way in which the same may be carried into effect; I hereby declare that the following are the improvements in this art, which I claim as having been invented by me, and which I desire to secure by letters patent.

"I claim the use of two more courses of planks running longitudinally upon the vessel, arranged in the manner and for the purpose described.

"I claim the employment of diagonal braces placed between the ribs of the vessel, or so placed that the braces themselves may form part of the ribs, and so arranged as to be in contact with the outer planking, or nearly so, that is to say, without any timber, plank, or other substance of considerable thickness, between the said braces and planking, the said braces being at the same time so adjusted that they may be forced hard to their bearings by means of wedges; the whole of which arrangement having for its object the producing a greater degree of inflexibility in the frame than has been ordinarily attained. In making this claim, it is to be understood, that I confine myself to the strengthening of the *hull of the vessel,* by wedged braces between the ribs, or by using braces as a substitute for ribs, a thing which will be readily distinguished from such frame work as has sometimes been used above the deck in certain vessels (as on steamboats for supporting the boilers and other parts of the machinery,) and not, therefore, properly connected with ship building. By referring to the description of such braces in this specification, it will be seen that I do not intend to limit myself to any particular form, or combination, of them, but to vary this and the material employed, as I may think proper, whilst the plan and object remain entirely the same.

"I claim the *combination* of two, or more, courses of planking outside the frame, with the use of diagonal braces of any form, or material, believing such a combination to be new and eminently conducive to both strength and lightness.

"I claim the use of one, or more, bands of timber, surrounding the vessel horizontally, or nearly so, and employed in the manner, and for the purposes, set forth.

"I claim the employment of iron bands passed over and under the upper and lower horizontal bands of timber, as a substitute for such ties of timber as I sometimes use, for the purpose of resisting and sustaining the force of the wedges employed with the diagonal braces, as described.

"I claim the double rebate along the keel, and the stem and stern posts, to receive the double planking, and to allow the outer layer of plank to overlap the inner layer, which said double rebate and double planking may be used with or without any other improvements herein described.

"I claim the use of diagonal braces sloping up from the keel, or keelson, to the ends or centre of the deck beams, or to the side timbers of the vessel,

or to the stem or stern posts, in the manner, and with the intention, herein made known.

"I claim the manner of using one or more ranges of stout timber between the floor timbers, running lengthwise of the vessel, and so constructed as to be wedged up, whether used alone, or in combination with dovetailed ties, uniting and bracing the deck beams, in order to prevent hogging, as described.

"I claim the use of plank, grooved in the manner described, for receiving the deck beams, and thus add strength to the upper works, generally.

"I claim, also, the employment of the system of wedging, not only as applied to my diagonal braces, but to braces of any form, or material, or to any other part of the ship's frame, as being the best and most convenient method of forcing all parts to their bearings, and thereby producing a great degree of firmness and inflexibility, which I hold to be essentially necessary in this sort of structure. I do not claim the use of wedges in the art of ship building generally, but I limit my claim to the use thereof for the purpose of stiffening the frame in all its parts, and as stationary appendages thereto."

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129. For an improved *Draft Box for Steam Engines;* Andrew M. Eastwick, city of Philadelphia, April 5.

(See Specification.)

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130. For a mode of forming a *Spiral flue for Steam boilers;* Benj. J. Miller, city of New York, April 5.

This flue is intended for cylindrical, low pressure boilers, and consists of a flat tube running spirally round from end to end of the boiler, between the exterior case, and an interior cylinder. The claim is to "the application of one or more spiral flues to steam boilers, as described."

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131. For an improved *construction of Canal Boats, for conveying the Horses by which they are towed;* John H. Long, Lewistown, Mifflin county, Pennsylvania, April 5.

"The nature of this invention consists in partitioning off a space about the middle of the boat, on either side, and thus forming a stall, or crib, of suitable length and breadth to receive the horses; and extending from the deck of the cabin to the bottom of the boat, in which is suspended, from the upper deck, a platform by blocks and tackles, for sustaining the horses, and for lowering them to the bottom of the boat when taken on board, and raised to the gunwale when they are to be removed."

"What I claim as my invention consists in the before described construction of the stall, in combination with the suspended platform, in canal boats, for conveying the horses by which they are towed, so as to have one or more of them at rest whilst the others are towing."

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132. For an improvement in *Repeating, or many-chambered, fire-arms;* Henry and Charles Daniels, Chester, Middlesex county, Connecticut, April 5.

In these fire-arms there is to be a countersink, or recess, at the rear end of the gun barrel; and at the outer end of the respective chambers there is to be a projecting rim to pass into this recess. The claims are to "the formation of the projecting rims around the mouth of the chambers, with the

corresponding recess at the back end of the barrel; and also the forming of the evolving axis which passes through the receiver, in such a way as that it shall force the said rim into the corresponding recess, and hold them there firmly, during the discharge of the piece; together with the use and arrangement of spiral, or other springs, within the breech."

We are not yet at the end of the catalogue of the patented many chambered fire-arms, although many of them have already run their short race, and will be remembered only by their *hic jacet* on the shelves of the patent office; and the class of inventors will soon discover that some new object must be started to arrest the attention of the public; a cessation of applications for patents for things of this character must soon take place, and we apprehend that they will not soon be resumed.

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133. For an improvement in the *Mode of Printing certain colours upon calico or other fabrics;* Bennet Woodcroft, Great Britain, April 5.

After describing the mode of procedure adopted by the patentee, he says: "Now whereas I do not claim, as my invention, either the printing machine, or the particular construction or material of the dress to be used by the said operatives. But whereas I do claim as my invention the enclosing calico or other fabric intended to be printed, along with the printing apparatus, whatever it may be, and the material to be printed upon them, in a chamber, case, or compartment, filled with an artificial atmosphere, deprived of, or devoid of, free oxygen, such as atmospheric air, deprived of its oxygen, as hereinbefore described, or any other suitable artificial atmosphere, and there printing the said calico or other fabrics, with a solution of deoxydized indigo when required to produce a blue colour, or with a solution of deoxydized indigo and other suitable materials as are usually used in combination with indigo, when required to produce other colours, and subsequently exposing the said calico and other fabrics, so printed as aforesaid, to the action of the atmospheric air, in order to imbibe the necessary quantity of oxygen therefrom to produce and fix the colours required."

An air-tight room is to be made of sheet iron, and this is to be furnished with an atmosphere of nitrogen; this is accomplished by means of a large air pump, which pumps the water out of the room, passes it through tubes into purifiers filled with a solution of sulphuret of lime, which deprives it of its oxygen, when it passes again into the room through tubes leading from the purifiers; and this operation is continued until no sensible quantity of oxygen remains in it. The entrance into the room is through a tank filled with water, which forms a water lute, by a partition dipping a little way below the surface of the fluid. This serves also to allow fresh air to be forced in by atmospheric pressure, as the volume is decreased by the absorption of the oxygen. The workmen have dresses of India rubber cloth, similar to diving dresses, and air is supplied to them by bellows and tubes, as in diving apparatus.

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134. For an improvement in the *Safety Life Preserver;* John J. White, city of Philadelphia, state of Pennsylvania, April 7.

This life preserver is to pass round the body in the ordinary manner, but instead of being one continued inflated bag, it is formed into a number of separate bags, connected, by mouth pieces and valves, with one common tube, by which they are all to be inflated. One of these bags is made so as

to constitute a bellows, by means of which the whole may be filled. The claims are to "the above method of forming isolated air chambers, rendered independent of each other by the interposition of valves, so that the loss of air in one will not affect the others, and yet capable of inflation from the same source. Also the mode of inflation by the bellows, as a constituent part of the machine, whether applied to life preservers or other manufactured articles requiring inflation."

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135. For an improvement in the *Scythe snath*; Samuel Puffer, Sunderland, Franklin county, Massachusetts, April 7.

The claims are to "a revolving bush, or circular plate, for changing the angle of the scythe, for cutting various kinds of grass, or grain, on various kinds of ground; also the detaching one end of the hook of the nib from the other, to cause it to embrace the snath more firmly," &c.

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136. For a machine for *Shearing Cloth;* Reuben Daniels, Woodstock, Windsor county, Vermont, April 7.

In this machine the shearing is effected by revolving blades, and many of its other appendages resemble those of preceding machines. The particular arrangements upon which the claims are founded are to be understood only by an examination of the whole together; these particular parts are named in the claim, but not in such a manner as would convey any idea of the particular combination in which they operate, and we therefore do not insert it.

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137. For an improvement in *Carriage Springs;* William Sharp, Burdett, Tompkins county, New York, April 7.

There have, of late, been many applications for patents for carriage springs, principally of the elliptic, or bow kind, which have been variously combined together. A number of these applications have been rejected, but a number of them also have been passed, as possessing some degree of novelty in their arrangement, although, in some instances at least, there did not appear to be much of utility connected with it. The claim of the present patentee is to the "bending inwards of the elliptical springs in the manner and for the purpose described, and also the inside stays, or springs, in combination."

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138. For an improvement in *Coach Lamps;* William Lawrence, Wallingford, New Haven county, Connecticut, April 7.

The claim to improvement in this lamp consists in a shank at the bottom of the lamp, into which descends a small tube containing the wick, and in a raised part at the bottom of the lamp. Although these things may be new, they do not appear to be of sufficient importance to require particular description.

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139. For a *Mortising Machine;* Francis and Thomas Burdick, city of Brooklyn, New York, April 7.

The general plan of this mortising machine is that of the larger number of similar instruments; the particular difference is in the manner of working the slides up and down, which carry the chisels. There are two slides, each of which carries a chisel, and these slides are carried up and down alternately by means of a pinion placed between racks on the inner edges of these slides, which are guided between vertical cheeks. A pendulous lever,

or handle, hangs from the shaft of the pinion, and by swinging this backward and forward, the motion of the slides and chisels is obtained. A feed hand is also made to operate in notches on the sliding bed piece which supports the timber to be mortised. The claim is to "the double rack, or slides, to which the chisels are attached, worked by one pinion in the manner described." The granting of the patent is *prima facie* evidence that there is novelty in the thing claimed; we do not perceive, however, in what consists the superiority of this new arrangement of parts, over those of some former mortising machines.

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140. For a *Mortising Machine;* Ira M'Laughlin, Sunderland, Bennington county, Vermont, April 7.

The claim under this patent is to "the method of securing the chisel, by which means it can be readily reversed; and the method of moving the chisel backward and forward." The remark on the foregoing patent may, we think, apply generally to this.

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141. For a machine for *Paring, coring, and dividing apples;* Robert W. Mitchell, Martin's Mill, Richland county, Ohio, April 13.

This, we believe, is the fourth patent obtained for the same purpose; in that before us the apple is to be placed on a fork at the end of a shaft, or mandrel, turned by a crank, whilst the paring knife, furnished with a guard, is held in the right hand, and passed from end to end over the apple; this is then pushed towards the shaft which is furnished with knives that cut it into quarters; a centre, tubular knife removing the core.

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142. For an improvement in *Canal Lock gates;* Franklin Livingston, Waterford, Saratoga county, New York, April 13.

The improvements claimed consist in a particular mode of constructing, or forming, the bearings of the gudgeons of valve, or wicket, gates; and the application of a screw, working horizontally, for opening and shutting such gates; the arrangements of which require, for their illustration, an examination of the drawings.

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143. For an *Apparatus for Extinguishing sparks in locomotive engines;* William T. James, city of New York, April 13.

There are several things in the construction of this apparatus analogous to some others intended for the same purpose. The smoke pipe is surrounded by a second pipe sloping outwards from it, and having a wide, or trumpet, mouth, extending somewhat above that of the smoke pipe; the smoke and sparks from this latter are to escape through lateral, curvilinear openings, by which it is intended to give to the sparks a rotary motion between the two pipes, and allow them to fall, by their gravity, into the receptacle formed by the junction of the said pipes. There is a cover to the smoke pipe in the form of an inverted cone, which is designed to co-operate with the other parts of the apparatus in producing the desired effect; likewise a flanch within the upper edge of the outer tube, sloping downwards, with the same view.

The claim is to "the combination of the outer tube, the flanch, the conical cover, the openings and spiral flues, in their combination with a smoke pipe, or chimney."

We have not heard the result of the experiments with this apparatus,

but are convinced that if it is so constructed as to arrest the sparks, it will, like its predecessors, impede the draught.

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144. For a machine for *Plating dough, and cutting crackers, cakes, &c.*; John M. Neagle, New Haven, Connecticut, April 13.

We are informed that "the principle of this invention is to cause the dough placed in the hopper to pass between two sets of plating rollers, and thence over one or more bed rollers, on which forming and trimming cylinders may operate to give the stamp, or print, and shape intended, and thence discharge it upon baking pans, ready for the oven, by simply turning the crank, or otherwise moving the machinery."

This apparatus is represented in eleven separate figures in the drawing, fully showing the whole arrangement. The claims are to "the friction rollers for the bottom of the hopper, and for the table between the bed rollers, as described. The trimming cylinder. The mode of forcing out the dough, thereby discharging the cutters."

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145. For an *Apparatus for obtaining a high degree of velocity on rail-roads;* Jacob Nollner, city of Washington, April 13.

This is one of those strange conceits which sometimes insinuate themselves into the minds of intelligent men, although it would be difficult for a looker on to find the avenue by which it could obtain an entrance; indeed it might well be supposed that every avenue leading into such minds would be so well guarded by the watchful centinel, good common sense, as effectually to repel such interlopers. The plan proposed is neither practical, or practicable, nor did the inventor himself really think it so, but determined to place it upon record, under an impression that it might suggest, or lead to, something useful; "so mote it be."

Let a rail-road be made, perfectly level and straight, and solid as the everlasting hills; let a car twenty miles long be placed on this, and be drawn by any adequate power; let another car, say of ten miles in length, be placed on this first car, at its rear end, and let this also have an adequate independent motive power applied to it. Now let the two cars set off together at the rate of twenty miles an hour; the upper car will, in this case, travel over the ground at the rate of forty miles an hour, twenty being due to the motion of the lower car, and twenty to its own motion. In the model at the patent office, there are four or five such cars, or movable rail-roads, stratum superstructum. The following is the claim:—

"What I claim is the placing of two or more movable rail-ways, platforms, or articles capable of progressive motion, one above the other, so that each may be drawn along by an independent power applied to it, and, like itself, sustained upon the rail-road, platform, mounted rail-way, or other article upon which it is to move; and this I claim, whatever form or arrangement the same may be made to assume, whilst the principle of action is the same with that herein exemplified."

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146. For an improved *Fire Engine Pump;* Joseph Newman, city of Baltimore, April 14.

This is a device for converting the common street pump into a fire engine, by adding a forcing apparatus at its top, furnished with an air vessel, and other appendages. When thus used, the ordinary spout is to be stopped, and a hose or branch pipe applied to the forcing apparatus. The claim is to

"the combination of the common pump prepared as described, with the cylinder, piston, valves, or air chamber of the ordinary hydraulic or fire engine, which combination produces a twofold instrument, viz. a self supplying fire engine, and a culinary, or common, pump.

There is no novelty in the foregoing idea. The late Mr. Dearborn, of Boston, proposed a similar thing more than forty years ago, of which engravings are to be found in our own, and in foreign, journals. The thing, however, cannot possibly answer a good purpose when appended to the ordinary pump, as the power requisite to raise the water from a well, and to force it to the required height, cannot be applied to such a pump; and, if it could, but few such pumps would bear it. Whatever of ingenuity there may be in such a combination, will not be accompanied by a corresponding degree of utility.

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147. For a *Machine for Mowing, and Cutting, Grass and Grain;* David Lewis, Bern, Albany county, New York, April 14.

In this machine, the cutting is to be effected by a single scythe which crosses the frame from side to side, and has a vibrating motion given to it longitudinally, by means of a crank operated on by gearing from the wheels which run on the ground. The scythe is convex towards its cutting edge, and the grass, or grain, to be cut is borne up against it by the revolution of a cylinder having long projecting fingers, and which is placed sufficiently above, and in advance of, the edge of the knife, to effect the proposed object.

The claims made are to "the particular structure of the traverse bars, and the manner of sustaining and operating the scythe, as described. The revolving comb or straightener preceding the scythe and preparing the grain for its operation, in combination with the scythe, constructed and operating as described. The hind, or caster wheel, in combination as herein described, by which the hinder end of the machine can be raised at pleasure."

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148. For a machine for *Making Bricks;* Samuel B. Brustar, Kensington, Philadelphia county, Pennsylvania, April 14.

In this machine, as in many others, the clay is to be tempered in a circular trough, by means of revolving wheels which roll over it. Outside of the tempering trough there is a moulding trough, within which the moulds are to be laid; and the clay, transferred to this trough, is to be pressed into the moulds by rollers passing over them. The whole machine is a structure of considerable complexity, not well described or represented in the first instance, and not capable of being clearly presented in words. The claims are to a number of particular things referred to in the specification, and, if given, would not convey any definite idea. The machine may be a good one; but as presented, it does not, to us, wear a promising aspect.

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149. For a machine for *Moulding and Pressing Bricks;* Stephen Waterman and Charles Learned, Charleston, South Carolina, April 14.

In this machine the clay is mixed in a vessel, or chamber, in the centre of the machine, in which a shaft revolves, that is furnished with knives, in a manner well known for preparing clay at potteries, and in brick making; by them it is forced into moulding boxes at the sides of the machine, under which the moulds are to be placed on a suitable platform. The claim re-

fers principally to the manner of forcing down the vertical pistons within the moulding boxes; this is done by pieces in the form of inclined planes, and carried round by the sweep attached to the centre shaft; which inclined planes pass against friction rollers at the upper ends of the shafts of the pistons, and force them down; after which they act upon vertical shafts connected with levers that raise the pistons, allowing the filled moulds to be removed, and empty ones substituted for them.

Claim.—"We claim the application of inclined planes to the forcing down the pistons for pressing brick, in the manner described. We do not claim the mixing, or press boxes, or the oblique knives; these and other parts having been previously known and used; all that we claim as our invention being the inclined planes for forcing down the pistons and slides; the particular combination of the two vertical slides, with their connecting parts for lifting the pistons and causing the moulds to traverse on the ways."

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150. For an improved *Water Wheel;* John R. Wheeler, Seneca Falls, Seneca county, New York, April 14.

The water is to be made to strike upon the buckets of this wheel by passing through issues in a circular rim surrounding the wheel. Particular directions are given respecting the curved form of the buckets, but there is not any thing in this wheel to distinguish it from others that have been previously used, excepting these peculiarities of form which do not seem calculated to alter the action in any appreciable degree.

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151. For an improvement in the *Steam Engine;* William L. Lightall, city of Albany, New York, April 14.

The object in view in this engine is so to arrange the levers and other working parts as that the cylinders may be placed horizontally at the bottom of the vessel. This mode of arrangement is described and represented with much clearness and distinctness, and the inventor, after describing it, observes that, "It will appear that the cylinder may, in all cases, be laid horizontally on the keelson, or keelsons, placing it and all the other machinery so low that its weight, instead of its being as it now is, a necessary and unavoidable incumbrance, will act in a great measure as judiciously stowed ballast. That in vessels of war, or armed steamers, all the essential and vital parts of the machinery will be completely protected from an enemy's fire, and that the acting engineer can perform his duty not only with safety, but with that self-possession which personal security could alone insure." The claims refer to the particular description of the respective parts as arranged, but would not, alone, afford any distinct information respecting them.

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152. For an improved mode of *Working the Pistons of Pumps;* David Whittier, Belfast, Waldo county, Maine, April 14.

"The nature of my invention consists in the application of inclined planes inserted upon the outer circumference of a wheel, or cylinder, (which is made to revolve like the capstan of a vessel,) to the spear, or piston rod of a pump, so as to force it up and down."

In the drawing, force pumps are represented as placed near the periphery of a low, vertical cylinder, or drum, on the deck of a vessel, there being levers, or handspikes, to carry the cylinder round. Projecting, inclined ledges come in contact with friction rollers on the piston rods of the pumps,

and alternately raise and depress them. The claim is to this mode of working pumps, and we believe that the patentee might have enjoyed the exclusive right thereto without having had it secured to him by law.

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153. For an improvement in *Many Chambered Cylinder Fire Arms;* Theodore F. Story, Northampton, Hampden county, Massachusetts, April 21.

The general construction of this gun is the same with several which we have heretofore described; there is considerable ingenuity in the arrangement of the respective parts of the lock, and in the device for revolving the cylinder by its action. The percussion caps are to be placed immediately behind the respective chambers in the revolving cylinder. We do not think it necessary to give the claims.

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154. For improvements in the *Machine for making Axes;* Demmon C. Stone, Naponock village, Ulster county, New York; assigned to Joseph Wright, of Poughkeepsie, New York, April 21.

This machine is intended to prepare the axe ready for welding, by taking the piece of iron, cut off of the proper size, and carrying it through all the requisite operations, until ready for the steel. The claim is to the combination of the various parts for that purpose, as described; the necessary complication of these parts is such as to forbid an attempt at description.

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155. For a *Saw Mill without Saw Gates;* John C. Yates, Columbia, Maury county, Tennessee, April 21.

The claim under this patent is equally brief and meagre, and that simply because there was but little to claim, and that little of little importance. It is to "the form of the fulcrum of the vibrating beam, in combination with the rectangular boxes on which it moves." There is a vibrating beam, like that of a steam engine, having a saw affixed, by means of shackle bars, at each of its ends; the lower ends of said saws being, in like manner, connected to cranks on a revolving shaft. The fulcrum of the beam, instead of being a round pin, is polygonal, or triangular, having one of its sides downwards, two of its angles thus becoming fulcra alternately. The supposed advantage of this is set forth in the specification, but we cannot afford the room to give the reasoning on the subject.

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156. For an improvement in the *Steam Engine;* Seth Graham, Roxbury, Norfolk county, Massachusetts, April 21.

This is a bad contrivance, with little novelty, and no utility. A revolving cylinder having a groove around it, such as would be produced by making a section of the cylinder at an angle of forty-five degrees with its axis, and then separating the two parts to a proper distance, to form a groove of suitable width. This groove is to admit a pin on the cross-head, furnished with a friction roller, and is thus to become a substitute for the crank. A shaft is to pass through the cylinder, is to run on proper bearings and to have a fly-wheel at one end; the steam cylinder, and appendages generally, resemble those of ordinary engines. In some places, where substitutes are admitted in the militia, a poor creature is allowed to take the place of an able bodied man; the substitute in this engine appears to us t belong to the same system.

157 For an improved process of *Dyeing Wool;* Felix Fossard, city of Philadelphia, April 21.

Mr. Fossard has obtained patents for the manufacture of the prussiate of iron, and the process of dyeing therewith, which patents have been made the subjects of notice in this journal. Some difficulties, it is understood, presented themselves in the application of the dye to the manufactured cloth, which will, it is believed, be obviated by the proposed process of dyeing in the wool. After giving the necessary instructions for carrying out the process, the patentee says that, "By this process the wool acquires a navy blue at a single dip of five minutes into each of the baths, and this affords a permanent color at a small cost, say five cents per pound of clear wool. The principle of this new process of dyeing does not reside in the salt of potash, or of iron, but with the acid which is added to each of the solutions, the direct action of which consists in its decomposing the fatty matter of the wool, in degrees corresponding with the various tints of blue to be obtained."

"What I claim as new in the above described process for dyeing wool and other similar matters, is the employment, substantially in the manner herein set forth, of an acid solution of the ferra-cyanuret of potassium, or of sodium, in connexion with an acid solution of one of the salts of the black oxide, or of the sesqui-oxide of iron; and also of an acid solution of the sesqui-cyanuret of potassium, or of sodium, in connection with an acid solution of one of the salts of the protoxide of iron; including in this claim the various combinations and modifications of the above named salts of potassium, or of sodium, with those of the salts of iron, an acid being used before, conjointly with, or subsequent to, the employment of the baths containing the respective salts, which yield a blue precipitate by the interchange of their elements."

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158. For an improvement in the *Art of Dyeing;* Patrick Magennis, Paterson, Passaic county, New Jersey, April 21. (See specification.)

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159. For an improved *Drill machine for sowing or planting grain;* George A. Hoyt, city of Albany, New York, April 21.

This machine in many of its parts, resembles others which have been in use, but there is a device for causing the grain to pass out through the dropping tube with increased celerity and certainty. This device consists of four arms of spring steel which project from a revolving shaft in the centre of the seed box. "These are of such length as to come into contact with the bottom of the hopper, and consequently pass over the mouth of the tube through which the seed is to pass; their ends enter this tube with a slight degree of force, but which is sufficient to impel the seed downward at the moment the valve below is opened; whilst at the same time they clear away such superfluous seed as might otherwise fall through." The claim is confined to these spring arms.

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160. For an improvement in the *Working of Bellows by Steam;* Martin Bell, Antis, Huntingdon county, Pennsylvania, April 24.

This contrivance resembles the water bellows, in which an inverted cylindrical vessel is made to rise and fall within a vessel of water, there being a vibrating beam carrying two such blowers. The claim is to the "enclosing

the outer cylinder by a head, through which the piston rod of the cylinder works air tight, by means of a stuffing box; and the particular arrangement and combination of the parts by which the steam is admitted and made to operate on the lower side or interior of the cylinder, as constituting a component part of a blowing machine, in the manner set forth."

We cannot praise this apparatus, and are apprehensive that the inventor will not expect us to do so, if he has carried his plan into operation.

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161. For an improvement in *Rail-road Cars, Carriages, or Trucks, &c.*; Joseph Harrison, Jr., city of Philadelphia, April 24.

The main object of this improvement is to obtain a more equal bearing upon the rails of the wheels of rail-road carriages than has been hitherto attained. The opposite ends of a spring are to bear upon two sliding boxes, in two plummer blocks, which boxes receive the ends of the two axles of the carriage wheels. The spring is of the usual construction, but mounted so as to vibrate on its centre, allowing the two wheels on each side to adapt themselves to the inequalities of the road, without altering the relationship of the action of the spring. Several variations in the mode of arrangement for carrying out the same principle, are described and represented by the patentee.

"In truck frames which turn on a centre, for the purpose of adapting the wheels to the curvature of a road, the patentee has, in order to render the system of the equalization of the pressure of the wheels upon the rails perfect, so constructed the frames of such trucks as that their sides shall not necessarily continue in the same plane, but be allowed to vibrate vertically to such extent as may be requisite to enable them to adapt themselves, and the wheels which they sustain, to any horizontal inequality in the rails upon which they are to run, as this cannot be effected by the limited action of springs."

In this latter arrangement the wooden sides of the truck frame are connected by transverse and diagonal bars of iron, which work on pins, allowing of the requisite vertical motion in the sides, whilst they are braced perfectly so as to prevent their racking laterally. The claims are as follows:

"What I claim as my invention in the within described modes of constructing cars, carriages, or trucks, to run upon rail-roads, is the constructing of the springs and their appendages, so that said springs may vibrate upon their centres, for the purpose, and substantially in the manner, set forth. I also claim the carrying out of the same principle, by means of a vibrating beam, or any analogous contrivance, connected and arranged so as to produce the same effect. I also claim the use of a truck frame which may be employed with cars and locomotive carriages of all kinds, to run upon rail-roads when trucks are required; said truck frame being constructed in such a way as that two parallel sides thereof may be allowed to play, in the manner and for the purpose set forth, whether the same be put together in the method herein made known, or in any other by which the same end is attained, on the same principle."

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162. For improvements in *Many chambered cylinder fire arms*; Rufus Nichols, and Edward Childs, Conway, Franklin county, Massachusetts, April 24.

We shall not dwell upon the specialities of the gun described in this specification; nor shall we give the claim, as this would not afford a knowledge

of the particular arrangements adopted. The general plan is like that of the arms already noticed in the list of patents for this month.

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163. For a *horizontal Straw Cutter*; R. A. B. Beach, Franklin, Williamson county, Tennessee, April 24.

On one end of a frame, or bench, placed horizontally, there is a crank shaft to which is attached a shackle bar, or pitman, which vibrates a slide, carrying knives for cutting the straw, which is placed vertically in a square box, or hopper, over the knives. There are certain appendages for regulating the length of the cut straw, and for other purposes.

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164. For an improved *Gate for flumes of mills;* William Buckminster, Framingham, Middlesex county, Massachusetts, April 25.

This is a simple, sliding gate, moved by a lever, the construction of which is described, though not very clearly, but we have not at the moment either the drawing or the model by us, and therefore pass it over.

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165. For a *domestic Spinner, for spinning wool, &c.;* Hiram F. Wheeler, Springville, Susquehanna county, Pennsylvania, April 25.

This is a device for enabling the spinster to spin a single thread without running out from the wheel, in the old fashioned mode, but allowing her to keep her seat during the whole process. The head carrying the spindle is made to run out upon ways, and to return back, by a complex kind of machinery, which we do not think it worth while to describe, and which there is little probability that our readers will ever see, unless it be in the form of a model, at the patent office. The only thing claimed is "the sliding of the head on ways in the manner described."

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166. For a machine for *pressing Bricks*; Gaylord V. Harper, Batavia, Genessee county, New York, April 25.

A horse is to turn a vertical shaft, by means of a lever, or sweep, and this, in its revolution, is to operate four, or more, pistons which press upon the clay, previously tempered, and placed in the moulds for that purpose. The description and drawing do not clearly exhibit the structure, and the claim is merely to "the mode of pressing and discharging bricks, as described."

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167. For an improved mode of *applying the Syphon for the uniform drawing of oil and other liquids*; James Gray, Fredericksburg, Spottsylvania county, Virginia, April 25.

The syphon is to float on the liquor to be drawn, so that its height and the level of the liquid may always correspond; for some of the purposes to which it is proposed to apply it, it may be valuable; we doubt its eligibility for lamps, however, although for lubricating some machinery it may answer well. The patentee says: "I am aware that the syphon is a common thing; but what I claim as new, and as my invention, is the using it in combination with, and attached to, a float, to support it on the surface of the liquid, for the purpose of drawing liquids out of the vessel which contains it, in uniform and equal quantities, as described, or in any way which is substantially the same.

"2d. I claim as new, and as my invention, the application of the syphon for the purpose of dripping oil, or any other liquid, on the mandrils and bearings of machinery, or for the construction of lamps, as set forth in the

specification and drawings; and in any way which is substantially the same in principle.

"3d. I claim as new, and as my invention, the small tube to slip up and down in the inside, or on the outside, of the leg of the syphon, whether to work with a screw or otherwise, so as to lengthen or shorten at pleasure, and for the purpose of increasing or decreasing the quantity it discharges in a given time."

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168. For improvements in the *Many-chambered cylinder Fire Arms*; Mighill Nutting, Portland, Maine, April 25.

We have already noticed three patent many chambered fire arms in the list for the present month. That now before us is like the others, having a revolving cylinder of chambers, and differing from them only in the arrangement of the lock, the apparatus for revolving the barrel, and their appendages.

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169. For a *Horse Power for propelling machinery*; James Secor, city of New York, April 28.

The platform upon which the horse is to walk is an endless floor passing round cylinders, and differing but little from many others; the main difference between this and similar horse powers consists in the addition of a governor, such as is used in steam engines, for raising or lowering one end of the platform, and thus regulating the rate of its motion; this application is claimed.

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170. For an improvement in *Water wheels*; John Mumma, West Alexandria, Preble county, Ohio, April 28.

The variation in this wheel from some others is not of a character to render particular description necessary; the claim is to "the combination of one, two, or more, tub wheels, with the wheel placed next the schute, and the mode of regulating the outlet of water, as described."

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171. For a machine for *Mortising and tenoning Timber*; Henry Barnes, Munson, Geauga county, Ohio, April 28.

The subjoined claims, although they do not lead to a knowledge of the particular structure of the parts, serve to show that the improvements are in mere matters of arrangement, leaving the rest of the structure the same with that of other mortising machines.

"I claim the construction of the carriages with the rests, bar clamps, and clamp bolts, as described. The arrangement of the lever and wedge for throwing the pinion out of gear, with the racks, as described. The method of connecting the pulley with the piston shaft by the spring, for allowing the pully to turn on the shaft as the cutting tool enters the wood."

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172. For an improvement in the *Saw Mill*; James Secor, city of N. York, April 28.

The claims are to a mode of feeding the carriage, and to a connecting lever for giving motion to the saw gate. The arrangements in this mill are such as to render it portable, and to adapt it to its being driven by horse, or other power, applicable to such mills. The saw frame is to be worked up and down by means of a lever beam, operated by a crank on the fly wheel, and there is, as the claim indicates, some novelty in the mode of feeding.

173. For improvements in the *Machinery for making brooms, brushes, mops, &c.*; John M. Spooner, Belchertown, Hampshire county, Massachusetts, April 28.

The patentee says that the nature of his invention consists in "providing a method of holding the broom, and furnishing and regulating the wire, or twine, by machinery, in such a manner as to permit the manufacturer to sit upright during the operation, and thereby to obviate the stooping position so injurious to health, which has been heretofore practised." The machinery consists, in part, of an apparatus revolving like a lathe, and carrying a spool for supplying the wire, or twine. The particular devices used form the main subject of the claim, and these are represented in the drawing.

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174. For a *Churn*; Joshua G. Pike, Lisbon, St. Lawrence county, New York, April 28.

This churn consists of a horizontal trough which is a section of a cylinder, having a shaft revolving in the centre of its curvature; from this shaft project paddles, or flights, standing at any convenient angle with the shaft, and in reversed direction from the centre towards each end. When the shaft is turned in one direction, the contents are gathered from each end towards the centre, and *vice versa*.

The claim is to "the placing of the paddles around the shaft, so that they shall direct the cream and butter towards the centre, or from the centre towards the ends, in the manner and for the purpose set forth."

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175. For an improved mode of *forming Kilns for making Charcoal*, Michael Carroll, Tellico Plains, Monroe county, Tennessee, April 28.

The specification of this patent directs the mode of piling the wood, when it consists of very large logs, in such a way as to burn them properly into charcoal in a kiln, managed, in other respects, in the ordinary way, and the claim is confined to the particular mode of piling pointed out.

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176. For a *Hinge for doors*, denominated the helical spring joint hinge; D. A. Hoyt, and P. W. Bulkley, Danbury, Fairfield county, Connecticut, April 28.

This hinge is to operate as a door spring, and for this purpose it is so constructed that instead of the middle knuckles of the hinge, a helical spring surrounds the joint pin, the two ends being so attached as to cause the hinge to close by the elastic force of the spring. Two portions of the hinge may, if desired, be so provided with helical springs; these may be made of brass wire, and they have a very neat appearance. The claim is to "the coiling of a spring around the joint pin of door, or other, hinges, in the manner set forth, such tension being given to said springs as shall cause them to close a door or other hinged article to which they may be applied; said hinge being constructed substantially in the manner set forth."

Specifications of American Patents.

Specification of a Patent for an improvement in the Manufacture of Gunpowder; granted to Richard J. L. Witty, *Lowell, Massachusetts, April* 2, 1838.

To all whom it may concern: Be it known that I, Richard J. L. Witty,

civil engineer, of the city of Lowell, state of Massachusetts, have discovered a new and powerful composition for the manufacture of gunpowder, and I do hereby declare that the following is a full and exact description thereof.

My discovery consists in using a material capable of yielding a large quantity of carburetted hydrogen, or inflammable gas, namely, bituminous coal. The coal is to be highly comminuted with certain proportions of sulphur and nitrate of potash. These three substances are taken in a powdered state, and then mixed together; but, since these ingredients vary in quality, or otherwise, they will require their definite proportions to be adapted to each other. Here follows a formula which I have used, and found to answer well, viz.:

Bituminous coal, . . .	26 lbs. or parts.
Nitrate of potash, . . .	156
Sulphur, ...	33½

And in order to make the gunpowder, the above ingredients are to be intimately mixed together, as must be the case in preparing gunpowder from any materials, and then the combination may undergo the same process as is at present practised with common gunpowder, viz. in the pressing, graining, glazing, and drying.

What I claim as my discovery is the making use of bituminous coal, instead of charcoal to form gunpowder with the other ingredients at present used, viz. sulphur and nitre, and for the use of these two last named ingredients I do not claim any exclusive right.

RICHARD J. L. WITTY.

Remarks by the Editor.—We very much doubt the improvement of gunpowder by the substitution of bituminous coal, for charcoal, in its composition; the production of carburetted hydrogen, spoken of by the patentee, will rather be a production of carbonic acid and watery vapour, these being the ultimate products of the combustion of the bitumen. We are very apprehensive, however, that the decomposition of the bitumen, and the combination of its constituents with oxygen, will not be equally rapid with the combination of charcoal and oxygen; this it is true, must be decided by experiment, and should the fact be such as we apprehend, the explosion will take place without the perfect decomposition of the bitumen, the powder will be injured in quality, and it will render the piece more foul than powder of the ordinary composition, which, indeed, when well made, does not require to be improved, as, if more powerful, the arms in which it must be used must necessarily be increased in weight.

Specification of a Patent for an improved method of forming Plates or Cylinders, with raised surfaces, for printing and stamping impressions on paper, silk, calico, cotton, and other fabrics or substances. Granted to GODFREY WOONE, *of the Kingdom of Great Britain, April* 2, 1838.

My invention consists in improvements in forming moulds or matrices, from which casts are to be taken in metal, or other substances capable of receiving a sharp impression, having on their surface the relief of the pattern, engraving, writing, or design, intended to be printed, or impressed, on calico, silk, paper, leather, or other fabrics, or substances on which impressions are now commonly taken from plates, blocks, or cylinders, with raised figures, engravings, or designs, produced thereon by cutting, engraving,

stamping, etching, or otherwise lowering the parts, or interstices between the work intended to be left in relief, or from stereotype casts obtained from such original plates or blocks. I obtain my moulds by the following methods, according to the nature of the pattern, engraving, or design, I am desirous of obtaining in relief. For the finer patterns used in calico, or other printing or paper staining, or for engravings such as are usually cut on box wood, and printed at a type-press, I make use of the following method: I take white lead and plaster of Paris, in different proportions, about two parts of white lead and one of plaster of Paris, mixed with water to the consistence of cream; I then pour this mixture, or composition, on a well polished and perfectly even plate or block of metal, or other hard substance, of the required size, varying the depth of the composition to the height of the required relief. For work to be printed at the type-press in the manner of wood engravings, the thickness of the layer, or composition, need not exceed the twenty-fourth part of an inch, but for coarser patterns, or designs, as for calico printing, the thickness of the composition must be increased to about the eighth part of an inch. The plate, or block, covered with the above composition, must be left to dry gradually, or be baked until it is entirely dry. Or in order to give this coating a more even and perfect surface, and obtain with greater exactness, the required thickness, or height, I lay the composition, or coating, on the plate, or block, thicker than I intended to work upon. After the coating has been well dried, I scrape or smooth the surface down to the required thickness with a piece of metal having a perfectly true and even edge or surface. I first trace on this composition, or coating, the design or pattern, in the usual manner now employed by engravers, or artists. I then proceed to engrave, etch, scratch, or draw, with a steel point, or other suitable instrument, or machine, all the lines or parts of the design through the composition or coating down to the metal, or substance, on which the composition or coating is laid. I now describe the second manner of forming my moulds, or matrices, which is preferable for the coarser patterns or coloring blocks used in calico or other printing, but may also be applied to finer work. I take a piece of metal, wood, paste-board, stone, or composition of plaster of Paris, of the height of the intended relief, and I glue, or otherwise fix, the same on a block of wood, metal, or other suitable material. I then cut, engrave, or etch, with acid in the usual manner employed by engravers, either the outline or the whole of the pattern, or design; when the outline only has been cut, engraved, or etched, it is necessary that those parts that are within the outline of the pattern, or design, should be taken out, or removed, in order to form a perfect mould, or matrice, of the pattern, or design, to be obtained in relief. If acid is used for obtaining this mould in metal, stone, &c., the plate of metal, or stone, &c., may be fixed on a block of wood, paste-board, or any other substance that is not liable to be corroded by the acid used for biting in the mould of design, or pattern.

It is necessary in order to procure a perfectly clear impression from the casts to be obtained from these moulds, that some parts should be lowered or depressed, in order that those parts may not receive the printing ink, or matter, when applied to the relief, and so produce a blurred, or imperfect, impression on the paper, calico, or other substance to be printed on. In order to effect this, I either take a cast from the mould immediately after it is finished, by the methods I have before described, and then proceed to finish the cast ready for receiving the ink, color, &c., by the usual methods employed by wood engravers, of cutting, engraving, scooping, or lowering

those parts of the cast which, in consequence of the distance between parts of the design, &c., require to be deeper than the rest, or I make use of the following method. After the whole of the design, engraving, or pattern, has been engraved, cut, or etched, on the composition of white lead and plaster of Paris, wood, metal, or other substance directed to be used for that purpose, I lay, or fix, on those parts of the mould required to be heightened for the purpose of obtaining a corresponding depression on the cast, or impression to be taken from it, with any convenient or suitable instrument, modelers' clay, or other fine earth, or composition, to the height required, taking care not to injure, or interfere with, the design or pattern which has been drawn, cut, or executed, on the mould or composition. Or the heightening matter may be laid on in the following manner: mix chalk, white lead, or any similar substance, with water, as thick as can be conveniently laid on with a brush, and apply this composition, or mixture, to those parts of the mould which require to be raised. When this last mentioned mixture is to be applied to the layer or composition of white lead and plaster of Paris, the mould or design drawn on the plate and layer of composition must be first carefully and slightly oiled.

In order to prepare the moulds for the operation of casting, they must always be perfectly dried, which may be effected either by allowing them to dry gradually, or baking them. These moulds may be cast, stamped, or moulded, in metal, papier-maché, or other substances now in use for obtaining casts of fine work for ornamental or other purposes capable of being cast, stamped, or moulded, and receiving a sharp and clear impression from the mould, and at the same time sufficiently hard for the purposes of printing. As there is no new feature in the method of obtaining a cast from my moulds, I do not consider it necessary to describe the process of casting, stamping, or moulding, as they may be cast by any of the usual methods employed for fine casting, and known to practical men, acquainted with the subject; but for casting fine work, similar to wood engravings, I prefer the method made use of in the process of stereotyping, or casting from moulds taken in plaster of Paris from original wood engravings. I likewise make use of the same metal or composition used for that purpose.

Casts may also be formed by placing the mould in any convenient box, or form, and pouring suitable metal into the mould or design.

The back of the plate is to be turned even in a lathe and mounted on wood, in the manner of stereotype casts from wood engravings, or letter press.

When the plates, or relief, are to be applied to cylinders, the metal, or substance, on which the mould is formed should have a circular, or curved form, corresponding with the circumference of the cylinder on which the plate of metal, or relief, is to be fixed; or the plate may be cast level and the required circular direction given by pressure.

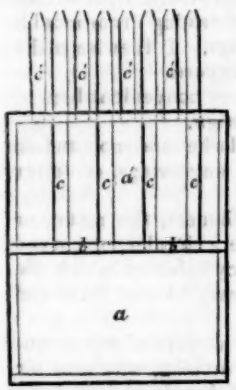
It may be observed that I do not claim as new, or as part of my invention, the mode of cutting, engraving, scratching, or etching, with acid for the purpose of forming a sunk design, or pattern, as they have long been known and practised for obtaining impressions on paper, &c., in the manner of copper plate engraving; but I claim as new the application of these methods in the manner I have described for the purpose of forming moulds from which casts can be obtained in metal, or other substances, having on their face the relief of the design, or pattern, which has been so cut, or etched, in intaglio, and by which means I effect a great saving of time and labor, in producing a relief compared with the method, or methods, now in

use, of first drawing the design, or pattern, on wood, and then cutting, engraving, scooping, or removing, all the parts, or interstices, between the lines, or tracings, of the drawing, which is attended with difficulty and inconvenience, and requires greater labor, time and skill than are required to form a relief by the methods herein specified. GODFREY WOONE.

Specification of a patent for an improved Draft Box for Locomotive Steam Engines. Granted to ANDREW M. EASTWICK, *city of Philadelphia, April 5, 1838.*

To all whom it may concern: Be it known, that I, Andrew M. Eastwick, of the city of Philadelphia, in the state of Pennsylvania, machinist, have invented a new and improved mode of constructing a draught box, to be applied to the chimneys of locomotive, or other, engines, for the purpose of increasing the draught by the action of the waste steam, and I do hereby declare that the following is a full and exact description thereof.

It has been the practice heretofore, where draught boxes have been employed for the purpose of increasing the intensity of the fire, by accelerating the rapidity of the current up the chimney, to suffer the waste steam from each of the cylinders of the engine to escape from them into one common compartment, or single draught box, whence it passed through suitable tubes into the chimney; in this mode of procedure, however, it has been found that there is an interference of the force of the escape steam from one cylinder with that of the other, so that the greatest useful effect is not produced. To obviate this difficulty, I divide my improved draught box into two compartments by means of a partition, or diaphragm, so formed and arranged as to cut off all interfering communication between the two, and to obtain the full effect of the waste steam.



In the accompanying drawing, which represents a vertical section through the centre of the draught box, *a*, and *a'*, are the two compartments into which is divided by means of the partition, *b*, *b*; the waste steam from one of the cylinders enters the compartment *a*, and from the other cylinder the compartment *a'*, through proper openings, constructed for that purpose, in the usual way. From the compartment *a*, the tubes *c*, *c*, *c*, lead through the compartment *a'*, and into the chimney, whilst from the compartment *a'*, the tubes *c'*, *c'*, *c'*, likewise conduct the steam into the chimney; at the escape end, these tubes, *c*, *c*, *c*, are usually narrowed to increase the intensity of the blast.

All that I claim as my invention, and wish to secure by letters patent, is the division of the draught box into two distinct compartments, in the manner and for the purpose set forth; not intending to confine myself to any particular form of apparatus, but to vary this as I may think proper, whilst the same effect is produced by means substantially the same.

ANDREW M. EASTWICK.

Specification of a patent for an improvement in the art of Dyeing. Granted to Patrick Magennes, *Paterson, Passaic county, New Jersey, April* 21, 1838.

To all whom it may concern: Be it known, that I, Patrick Magennis, of Paterson, in the county of Passaic, and state of New Jersey, have discovered a new and useful improvement in the art of dyeing, and I do hereby declare that the following is a full and exact description of said improvement.

The nature of my improvement consists in performing the operation of dyeing by one process, which is effected in the following manner.

The cloth, or other material to be dyed, is taken, without any previous preparation, and passed through the vessel, or box, containing the colouring matter, and from thence, immediately passed between heavy rollers, or squeezers, whereby the colouring matter is effectually forced into the cloth, or other material.

It is then dried; and being so dried it is passed through the vessel, or bag, containing the proper mordant, and from thence again immediately passed between heavy rollers, or squeezers, whereby the mordant is also effectually forced into the cloth, or other material, which is then dried, and the process of dyeing is finished.

The colouring matter and mordants to be used in this process are the same as those commonly used by dyers, except that in this process they are more highly concentrated, and the degree of concentration depends upon the shade of the colour required. The rollers, or squeezers, and colour boxes commonly used by dyers, may be used for this process. But what I claim as my discovery and invention, and desire to secure by letters patent, is the manner of applying the colouring matter and mordants in a concentrated state, to the dry cloth, or other material to be dyed, by passing the same between rollers.

Patrick Magennes.

Progress of Practical and Theoretical Mechanics and Chemistry.

Mr. H. Pattinson "On a new process for the Extraction of Silver from Lead."

The object of this paper was to lay before the Section an account of a discovery made by the author some time ago, the application of which to practice constitutes a new process in the arts, and forms an important improvement in the operation of extracting silver from lead. When the quantity of lead raised annually in England and Wales is taken into account, the importance of any improvement in the process of obtaining it with greater facility, will at once be duly appreciated. In 1828, the quantity raised was 45,500 tons, from the following sources:

	Tons.
Mines of Alston Moor, Weardale, Derwent, &c.	22,000
Swalefield, Grassington-Palety, &c., Yorkshire	4,700
Derbyshire,	3,000
Shropshire,	1,800
Devonshire and Cornwall,	2,000
Wales, principally from Flintshire and Denbighshire,	12,000
	45,500

The quantity has varied very little since the above date. The whole of this lead contains silver. Of the 22,000 tons of lead raised in the mines of Alston Moor, Weardale, Teesdale, &c., about 16,000 tons contain silver at the rate of from 6 to 12 oz. per ton, the average being about 5. The 4700 tons from Swaledale &c. contain, as nearly as possible, 2 oz. per ton. The Derbyshire and Shropshire lead contains about an ounce, or the latter about $1\frac{1}{2}$ oz. per ton. The lead from Devon and Cornwall contains from 20 to 30 oz. per ton. One half of the lead from Flintshire and Denbighshire averages from $4\frac{1}{2}$ oz. to $6\frac{1}{2}$ oz. per ton, and the other half 9 to 10 oz. The old process for separating this silver was by cupellation, or refining. This process depended on the well known circumstance ,that lead, at a red heat, is easily and readily converted into an oxide; while silver, almost at any temperature, retains its metallic state. It consists, therefore, in exposing lead to a full red heat, with free access of air, so that the whole of the lead may be converted into an oxide, and separated from the silver, which is left behind in a state of purity. This oxide being mixed with coal, and heated to full redness, in a proper furnace, is reduced to the metallic state, called, in commerce, refined lead. But it is impossible to carry on the process of refining without a considerable loss of lead, as the oxide is very volatile, and flies off in large quantities from the refining furnace, in the form of a dense yellow smoke. The quantity of lead refined in 1828 would appear to be from

Alston Moor, Weardale, &c., . .	12,000
Devonshire and Cornwall, ...	2,000
North Wales, ...	4,000
	18,000

Upon which there would be lost, in refining, at least 1000 tons of lead. The importance of some more economical process was, therefore, at once apparent. The first idea which occurred to the author was, to distil the lead and leave the silver behind. A quantity of lead was accordingly introduced into a stoneware retort, and heated to redness for several hours. The retort was found to be in quite a soft state, from the intensity of the heat, and only a small portion of the lead had risen in the form of vapour, and been condensed on the upper part of its neck. But the fact was settled, that lead may be distilled, without determining whether it carried silver along with it. The next idea was, that as the specific gravity of silver is less than that of lead, there might possibly be a tendency in the silver to rise up to the top of a mass of lead, kept melted a long time at a uniform temperature; but, in no instance was there the least trace of any separation. Various other experiments were tried without success; but, in January, 1829, the author happened to require lead in a state of powder, and, to obtain it, adopted the mode of stirring a portion of melted lead in a crucible, until it cooled below its point of fusion, by which the metal is obtained in a state of minute subdivision. In doing this, he was struck with the circumstance, that, as the lead cooled down to nearly its fusing point, little particles of solid lead made their appearance, like small crystals, among the liquid lead, gradually increasing in quantity as the temperature fell. After observing this phenomenon once or twice, he began to conceive, that possibly some difference might be found in the proportions of silver held by the part that crystallized, and the part that remained liquid. Accordingly, he divided a small quantity of lead into two portions, by melting it in a crucible,

and allowing it to cool very slowly, with constant stirring, until a considerable quantity crystallized, as already mentioned, from which the remainder, while still fluid, was poured off. An equal weight of each was then submitted to cupellation, when the button of silver from the liquid proved to be very much larger than that from the crystallized lead; and thus the somewhat curious fact was discovered, that fluid lead, holding silver in solution, suffers a portion to escape from it, under certain circumstances, in the act of becoming solid. The lead used in the original experiment was what is considered rich in silver. It contained 4 oz. 15 dwts. 8 grs. per ton, and was divided into a crystallized portion, found to contain 25 oz. 4 dwts. 21 grs.; and a fluid portion holding 79 oz. 11 dwts. 12 grs. per ton, the latter being necessarily much smaller than the former in quantity. It was not until the spring of the year 1833, that the author was conveniently circumstanced to proceed in applying to practice the principle which he had developed. Four or five tons of lead being melted in a large cast iron pot, was carefully freed, by skimming, from all dirt and oxide, and its surface made quite clean. It was then suffered to cool very slowly, care being taken to break off and mix with the fluid mass, from time to time, any portion that might congeal on the sides of the pot. When the temperature had fallen sufficiently, small solid particles or crystals began to form, principally upon the surface of the melted mass. These, if suffered to remain, would have adhered together and formed a solid crust; but being continually struck, and the whole body of metal kept in motion by constant stirring, they sank down to the bottom of the pan, and soon appeared in considerable quantity. The author, however, did not succeed in making the lead sufficiently poor in silver; a pot filled, for example, with 8 oz. of lead, would yield at first crystals holding from 1 to 2 oz. of silver; in a little time, as the lead in the pot became richer, by receiving silver from the previously formed crystals, it yielded crystals of 2 to 3 oz. and the crystals became progressively richer, until in the end the original lead was divided into three parts of crystallizing lead holding about 4 oz., and one part liquid lead holding about 20 oz. per ton. In order to drain the crystals more completely from the liquid lead, they were exposed, after withdrawal from the pot, to a reverberating flame, so as to melt out more liquid lead. In this way, from lead holding 12 oz. of silver per ton, there were obtained four parts of lead containing $\frac{3}{4}$ oz. per ton, and one part containing 50 oz. per ton. The exposure, however, a second time to heat was expensive, and the author was induced, in consequence, to recommend, in preference, the simple plan of repeated crystallization; it has now become the established process. The apparatus required for the separating process is exceedingly simple, and consists merely of a number of nearly hemispherical iron pots, each capable of holding about five tons of lead—the size for which is about four feet diameter, and two feet three inches deep; one or two smaller pots, eighteen inches diameter by two feet deep; one required for the purpose of holding melted lead, in which the perforated iron ladles are to be occasionally dipped, to keep them hot; and another pot about two feet ten inches diameter, by one foot ten inches deep, for melting the ultimate poor lead to be cast into pieces. These, with a few perforated iron ladles, fifteen inches diameter, and five inches deep, and one or two whole ladles of lesser size, for casting the melted lead into pigs, are the principal articles required. The large pots are to be placed side by side in a line, each with a separate fire-place, (upon which there must be an ashpit door as well as a fire door,) and also with a separate flue and damper, and the heat of the fire in some measure retained by shut-

ting the ashpit door. Above the centre of this line of pots, at the height of six or eight feet, it is convenient to have a small iron railway with a frame or carriage, on four wheels, to move backwards and forwards the whole length of the range of pots, from which is to depend a chain terminated by a hook at the bottom, and reaching to nearly the top of the pots. This is for the purpose of more easily conveying the ladles filled with crystals from pot to pot. All this being provided, one of the large pots is filled with lead containing silver, say 10 oz. per ton, and after it is melted and skimmed, the fire is withdrawn, the damper put down, and the ashpit door closed, when it cools and crystallizes as already described. Crystals, as they are formed, are ladled out into the second pot, until about three-quarters of the whole have been removed, which will contain about 5 oz. of silver per ton: upon this the operation is repeated, giving lead of 2 oz.; and by a third crystallization, there is obtained, from this poor lead, holding not more than from 10 to 15 dwts. per ton, which is cast into pieces for sale as separated lead. The rich lead, on the other hand, is collected and repeatedly crystallized until it is made to contain 200 or 300 oz. per ton, after which the silver is extracted by cupellation. In working, the different pots at each stage are filled up always with lead of the same content of silver before beginning to crystallize, and a greater or less amount of crystals taken out, as the operator may think fit; in which respect the practice differs almost at every establishment, but the process is so very simple, and the mode of proceeding so obvious, that it is unnecessary to give a more minute detail. By operating in the way described, it is evident that but a very small portion of lead is made to undergo the process of cupellation, not more than one-twentieth part, when 10 ounce lead is enriched to 200 ounce by repeated crystallization; and as the loss by separation has not been found to exceed a 250th part of the whole lead, the loss by the joint processes becomes $-\frac{1}{12}$ of $\frac{1}{20}+2\frac{1}{250}$, or about one part in 120. The expense of separation is somewhat less than that of cupellation, so that by the reduction of expense and the reduction of the loss of lead, the extraction of silver is so far economized that 3 oz. per ton will now fully cover the charge. Applying this to the whole lead raised in the kingdom, as determined in 1828, we find that a much larger proportion can now be made to yield up its silver with advantage; we have, for example, within the limits,

	Tons.
All the lead of Alston Moor, Weardale, Teesdale, Derwent, &c.	22,000
Devonshire, Cornwall, and West Cumberland . . .	2,000
Lead of North Wales	12,000

making a total of 36,000 tons, from which, if we deduct the quantity formerly refined, we have an increase of 18,000 tons; and allowing this to contain, which it will do on the lowest average, 6 oz. of silver per ton, and 3 oz. to cover the cost of extraction, we have a clear gain to the arts of 54,000 oz. of silver per annum. The annual saving of lead will be about 300 tons. It is an important fact connected with the separating process, that the separated lead is much improved in quality, being more soft and ductile than ordinary lead. The reason of this is, that when the crystals are withdrawn from the liquid lead, being in the state of a coarse and very clean metallic powder, they are most readily acted on by the oxygen of the atmosphere, and come in contact with a great extent of heated surface, and the more oxidizable metals contained in the lead, as iron, zinc, &c. are separated. It is not improbable that the crystals are somewhat in the condition of spongy platinum, or Faraday's clean metallic plates. It now only remains to consider the reason why

the lead, in the act of consolidation, does so to the exclusion of the silver; and the most simple explanation seems to be, that the process is an instance of true crystallization, the homogeneous particles of the lead coming together by their molecular attraction, and repelling the heterogeneous particles of the silver. It is true, that, on account of the constant agitation, no trace of regular form can be seen in the solid mass, but if one of the pots in the act of consolidation, be allowed to remain a few moments at rest, so that a skin forms on the surface, it will be found, on removing carefully a portion of this skin, that it is distinctly crystalline on its under surface; which proves that it is only the agitation which prevents its always exhibiting this structure. It is well known, that when sea water freezes, the ice is nearly fresh, the salt remaining dissolved in the surrounding water; and that salt water requires a lower temperature for freezing than pure water. To this fact the phenomena of the consolidation of lead containing silver appear to be analogous, the fusibility of the lead being somewhat increased by the alloy. It may seem anomalous that lead, when alloyed with a metal, the melting point of which is so high, should be more easily fusible than the pure metal; but we have among metals many analogous circumstances. That such is the case, is further proved by the fact, that when lead containing silver is gradually fused, the first melted portions are richer in silver than the rest. The difference of fusibility is, however, not sufficient to allow of the separation of silver from lead by the ordinary process of eliquation; for in experiments made with the view of ascertaining how far this method might be employed in practice, in which the lead was exposed, on the grating of the reverberatory furnace, to a heat very cautiously increased till some drops of metal came out, it was found that, in lead containing 5 oz. 8 grs. of silver per ton, the first few drops sweated out contained 7 oz. 17 dwts. 9 grs. of silver; and that when two-thirds were drained off, the portion left contained still 3 oz. 13 dwts. 16 grs. of silver per ton. In another experiment, a piece of the same lead, drained very slowly, till reduced to one-fourth or one-fifth of the original quantity, left lead containing per ton 1 oz. 17 dwts. 15 grs. of silver. Brit. Assoc.—Atheneum.

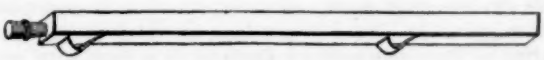
Instrument for Drying Silk in the Loom. By James Ryan.

Silk thread, like all other vegetable or animal substances composed of fine fibres, is hygrometric; that is, when exposed to a damp air, it absorbs moisture, from which it cannot afterwards be freed, except by raising the temperature sufficiently to convert the water into vapour, or to dissolve the water by the action of very dry air. Silk, in contact with damp air on all sides, becomes more moist, and in a shorter time, than similar silk wound into a ball or on a roller. A silk warp while in the loom, and partly woven, is wound on two rollers, the one, that on which the whole warp is first wound, and from which it is unwound and transferred to the second, or cloth roll, in proportion as it has passed through the process of weaving, and is become cloth. The space between these two rollers may be divided into two portions, separated by that part across which the shuttle passes; the portion between this part and the cloth roll being already woven into cloth, and the other being that part of the warp which has been wound off the roll, and is coming up through the harness to the shuttle. This portion is called the porré, and consists of parallel threads exposed, both above and below, to the air. In damp, cold weather, and during the winter generally, when

the weaver leaves off work at night, the air of his workshop becomes colder and damper, till its state nearly approaches to that of the outer air; and, therefore, when the weaver is desirous of beginning his work again in the morning, he finds the porré has become damp; the adjacent threads have, therefore, a tendency to rub hard against one another in making the shed, and the work proceeds heavily and slowly till the fire of his shop has become powerful enough to evaporate the moisture, which often will not be effectually done in less than two hours. Besides the loss of time hence arising, the work done under such circumstances feels loose and spongy, and is very liable to cockle, from certain parts of the threads being more moist than the others during the weaving, especially when two or more kinds of silk are employed in the same warp.

Another disadvantage is, that the brighter dyes now used, especially for spring wear, are many of them so fugitive, that they are much injured by mere dampness, to which they are particularly liable, as they must, of necessity, be woven during the winter. These difficulties and imperfections affect both the weaver and his master in so serious a degree, as to render their removal a matter of no small importance.

Mr. Ryan, after several unsuccessful attempts, at length hit on the simple instrument about to be described, with which he has always obtained the most satisfactory results.



It is a hollow quadrangular prism of tin plate, with a round neck at one end, closed by a cork; the length of the prism is about equal to the length of the porré, and on the under side are two handles to render it more manageable. The prism, being filled with hot water, is applied first to the under, and then to the upper surface of the porré, till, by means of it, all the moisture is evaporated. This is often so considerable as to cause a visible steam while it is passing off. The instrument is then applied to the harness; and the whole is thus made dry, and brought into a state proper for working in from ten to twenty minutes, according to its previous state of dampness.

From the evidence of practical weavers, who have made use of Mr. Ryan's instrument, it appears that the injury caused by dampness, both as regards the work and the more fugitive colours, is not at all exaggerated, and that, by the use of the instrument, they have constantly obtained the advantages attributed to it by the inventor. Ibid.

Centripetal Dial Plate. By C. and J. M'Dowal.

The word *centripetal*, applied by Messrs. M'Dowal to their dial plate, is liable to mislead; it having no reference, as used by them, to centripetal force, but merely implying that the divisions indicating minutes, instead of being placed on the circumference of the plate, (as is the common practice) are arranged in concentric circles, and are reckoned from the outer towards the inner circle.

In the common dial plate, while each of the hour spaces occupies one-

twelfth of the circle, the sum of the minute spaces for each hour occupies the entire circle. By this contrivance, a space sufficiently large for the clear indication of each minute, is rendered consistent with a dial plate of moderate size. But, in this case, it is evident that two hands, or pointers, are required, of which that which indicates minutes must move twelve times as fast as that which indicates the hours. If each hour space, instead of being divided into five, were divided into sixty, it is obvious that then the hour hand itself would indicate the minutes; and, therefore, that the minute hand, with the mechanism by means of which it is connected with the hour hand, would be saved.

Both Dr. Franklin and Dr. Ferguson invented clocks on this principle; that is, with only one pointer, and arranged their dial plates accordingly. The dial plate of the present inventors is far more simple than those invented by either of the two philosophers above mentioned. But, in order to overcome the difficulty of dividing each hour space with sufficient minuteness, a large plate is necessary. Each hour space is divided into three equal parts, by radial lines, and these parts are each subdivided into ten, the marks indicating the subdivision being placed (for greater distinctness) not side by side, but corresponding with ten concentric circles, and are read off, beginning from the outer, and going in succession to the inner, circle. Thus each hour space is divided into thirty parts, each of which indicates two minutes. Ibid.

Various Methods of Bronzing Casts, &c.

Bronzing is the art of giving to objects of wood, plaster, &c. such a surface as makes them appear as if made of bronze. The term is sometimes extended to signify the production of a metallic appearance of any kind upon such objects. They ought first to be smeared over smoothly with a coat of size or oil varnish, and when nearly dry, the metallic powder made from Dutch foil, gold leaf, mosaic gold, or precipitated copper, is to be applied with a dusting bag, and then rubbed over the surface with a linen pad; or the metallic powders may be mixed with the drying oil beforehand, and then applied with a brush. Sometimes fine copper, or brass filings, or mosaic gold, are mixed previously with some pulverized bone ash, and then applied in either way. A mixture of these powders with mucilage of gum arabic is used to give paper or wood a bronze appearance. The surface must be afterwards burnished. Copper powder, precipitated by clean plates of iron, from a solution of nitrate of copper, after being well washed and dried, has been employed in this way, either alone or mixed with pulverized bone ash. A finish is given to works of this nature by a coat of spirit varnish.

A white metallic appearance is given to plaster figures by rubbing over them an amalgam of equal parts of mercury, bismuth, and tin, and applying a coat of varnish over it. The iron coloured bronzing is given by black lead, or plumbago, finely pulverized and washed. Busts and other objects made of cast iron, acquire a bronze aspect by being well cleaned and plunged in a solution of sulphate of copper, whereby a thin film of this metal is left upon the iron.

Copper acquires, by a certain treatment, a reddish or yellowish hue, in consequence of a little oxide being formed upon its surface. Coins and medals may be handsomely bronzed as follows: 2 parts of verdigris and 1

part of sal ammoniac are to be dissolved in vinegar; the solution is to be boiled, skimmed, and diluted with water until it has only a weak metallic taste, and upon further dilution lets fall no white precipitate. This solution is made to boil briskly, and is poured upon the objects to be bronzed, which are previously made quite clean, particularly free from grease, and set in another copper pan. This pan is to be put upon the fire that the boiling may be renewed. The pieces under operation must be so laid that the solution has free access to every point of their surface. The copper hereby acquires an agreeable reddish brown hue, without losing its lustre. But if the process is too long continued, the coat of oxide becomes thick, and makes the objects appear scaly and dull. Hence they must be inspected every five minutes, and be taken out of the solution the moment their colour arrives at the desired shade. If the solution be too strong, the bronzing comes off with friction, or the copper gets covered with a white powder, which becomes green by exposure to air, and the labour is consequently lost. The bronzed pieces are to be washed with many repeated waters, and carefully dried, otherwise they would infallibly turn green. To give fresh made bronze objects an antique appearance, three-quarters of an ounce of sal ammoniac, and a dram and a half of binoxalate of potash (salt of sorrel) are to be dissolved in a quart of vinegar, and a soft rag, or brush, moistened with this solution, is to be rubbed over the clean bright metal, till its surface becomes entirely dry by the friction. This process must be repeated several times to produce the full effect; and the object should be kept a little warm. Copper acquires very readily a brown colour by rubbing it with a solution of the common liver of sulphur, or sulphuret of potash.

The Chinese are said to bronze their copper vessels by taking 2 ounces of verdigris, 2 ounces of cinnabar, 5 ounces of sal ammoniac, and 5 ounces of alum, all in powder, making them into a paste with vinegar, and spreading this pretty thick, like a pigment, on the surfaces previously brightened. The piece is then to be held a little while over a fire, till it becomes uniformly heated. It is next cooled, washed, and dried; after which it is treated in the same way once and again till the wished-for colour is obtained. An addition of sulphate of copper makes the colour incline more to chesnut brown, and of borax more to yellow. It is obvious that the cinnabar produces a thin coat of sulphuret of copper upon the surface of the vessel, and might probably be used with advantage by itself.—*Dr. Ure's Dictionary of Arts, &c.*

Lond Mech. Magazine.

Crystallization by Electricity.

A paper was read by Andrew Crosse, Esq., of Bromfield, Somerset, before the London Electrical Society, 19th of June, 1838, containing an account of a series of daily observations made with a sustaining battery, to ascertain the increase or diminution of the power of the same, as corresponding with the increase or diminution of the temperature of the atmosphere during a part of the last winter, and commenced previously to the very severe frost; and also a few remarks on the agency of heat, in electro-crystallization. As it is the intention of the Society to print this paper in their transactions, we can only briefly allude to the contents.

The observations on the sustaining battery are for a period of 28 days,

from the 23d December, 1837, to 19th January, 1838. The weekly average result is as follows:—

Gas collected.*		Average Temperature.	
First week	434°	a little above	50°
Second week	388°	not quite	46°
Third week	310½°	"	37°
Fourth week	306°	a little above	32°

There is, however, a singular fact connected with the above observations, viz. that on the last day, with the thermometer at 32°, with ice in all the cells, the quantity of gas obtained in the volameter was exactly the same as on the first day, when the thermometer was 50°.

In the experiments for the formation of crystals, Mr. Crosse tried the effects of heat in combination with voltaic electricity. The solutions were kept at the boiling point from one to six weeks, the solutions being constantly replaced as they evaporated, which, in some instances, exceeded 7 gallons in every 24 hours.

Mr. Crosse exhibited several specimens of the crystals, chiefly of copper and its compounds. Taking up one, Mr. Crosse said, this is iridiscent copper ore, produced in eight months by this simple process. When the negative and positive cells contain sulphate of copper and muriate of ammonia, crystals of various kinds are formed. If the process of crystallization be carried on in the dark, with hot solutions and water, there will not be any cessation of action: but in the usual way of experimenting, there seems to be a point at which crystallization stops. He produced a specimen (formed in the absence of light) of red oxide of copper, in crystals perfectly octohedral, which he considers to be very rare in nature. Mr. Crosse stated that six sided prisms of carbonate of lime, attached to a coil of wire suspended in a glass vessel, were destroyed when exposed to the light.

Mr. Crosse is inclined to think, from a series of experiments which he is at present making, that fissures in the earth are caused by electrical action, and that, in all probability, every description of gems, found in the earth, can be formed by the union of pressure, heat, electricity, and absence of light.

Annals Electr.

On a Water Cushion for Electrical Machines. *By* C. V. Walker.

In common with other electricians, I have felt the inconvenience arising from the want of uniformity in the shape of glass cylinders for the electrical machine. Chancing to have one, which was very irregular, and finding the inefficiency of the common cushion, (for while at times it exerted a strong pressure, at other times it exerted no pressure at all) I was led to adopt the arrangement of which fig. 1 is a section, and fig. 2 a back view. A, B, C, is a cushion formed of Indian rubber, and covered with wash leather, presenting to the cylinder a surface A, B, C. It is filled with water, by means of a condensing syringe, through a valve D, at the back. To give strength, the side A, C,

Fig.1.

* Mr. Crosse collected the liberated gases in a cylindrical glass tube, graduated into equal parts, which are here called degrees.

is attached to a metal plate *x*, *y*, by passing a needle, with stout thread, through the leather cover and through holes drilled in the edge of the plate, as seen in fig. 2.

The amalgam is not applied to the cushion itself, but to a silk flap attached to its lower edge, and passing between it and the cylinder.

The free motion of the particles of water among themselves rendered this a great acquisition, for it accommodates itself so as always to present the requisite pressure to the revolving cylinder. Should any of your readers object to it on account of water being present, I would say, that the experience of two years satisfies me that no dampness originates from that source; and this results from the Indian rubber being water proof, and the valve water tight.

The merit of inventing the water cushion is due to Mr. T. Forster, 14 Basing Lane, who applied it to a purpose in surgery; but, on my suggesting that it would be a desirable substitute in place of the usual rubber of the machine, he kindly arranged one as above, which answers every expectation.

Idem.

On Electro-Magnetic Coil Machines. By Uriah Clarke.

I have made an experiment, which is, I think, calculated to support the opinion of some recent theorists, that the earth acquires and maintains its polarity by galvanic agency; to effect this experiment, a globular battery is first constructed in the following manner: by passing right through the centre of a hollow copper sphere of four or five inches diameter, a tube of zinc of one inch diameter, in which tube of zinc is placed a bar of soft iron, having upon it a helical coil of covered copper wire, one end of which wire is soldered to the zinc tube and the other end to the copper globe. Care must be taken that the zinc and copper do not touch each other, but the joining must be made good by sealing wax or some other non-conducting substance; a saturated solution of common salt is then to be poured into the globe, and the globe suspended by means of an agate cap, or floated in a vessel of water, and it will immediately indicate polarity, arranging itself in the magnetic meridian. Pour out the salt water, and the effect of course ceases. If we may assume that there is any analogy between the action of the salt water on the metals of this little globe and that of the waters of the ocean upon the metallic strata of the earth, are we not at once furnished with a grand final cause for the saltness, as well as the vastness, of the waters of the sea?

Idem.

Constant Galvanic Battery. By Professor J. F. Daniell, *in a Letter to Dr. Faraday.*

I have just completed a *constant battery* of large dimensions, the effects of which exceed my most sanguine expectations, and open new views of the possible application of the extraordinary powers of the voltaic current to economical purposes. It consists of only ten copper cells 20 inches high, 3½ inches diameter, as in the first battery. The interior partitions are formed by merely tying the open ends of oxen's gullets to the rings of the colanders for supporting the sulphate of copper, and which are made deeper than before, and suspending them in the cells, to the bottoms of which they reach. These membranous bags contain each rather more

than a quart of the dilute acid. The zinc rods are of the diameter of $\frac{1}{8}$th of an inch, well amalgamated, and the connections are made as before described. At the temperature of 67° this battery produces, in the voltameters which I have all along employed in these researches, 12 cubic inches of the mixed gases per minute, or 720 cubic inches per hour. Its powers of ignition are very great; and while it will maintain 6 inches of platinum wire $\frac{1}{100}$th of an inch diameter red hot, it will still decompose water at the rate of 14 cubic inches per five minutes. The permanence of this result is very striking.

When the battery is not in use the rods are taken out and wiped, and the membranous bags carefully lifted out of the cells, emptied of their acid, filled with water, and suspended from a frame placed for their reception. By this treatment I do not find that they are liable to any change of texture or deterioration; and I have now membranes which have been in use for several months and are quite perfect. If the acid be perfectly washed out of them they may even be dried with impunity; but it is better to preserve them in a moist state, as when dry they are liable to crack. The acid solution of sulphate of copper remains in the cells without injury, and in ten minutes the battery, when required, may be brought into action. There is no reason to think that the limits of efficiency have yet been nearly attained, and the gullets could easily be connected together so as to obtain bags of any required length. I scarcely, however, think that in simplicity and cheapness of construction, the battery can be further improved. Ibid.

Kindling Phosphorus by a discharge from a common electrical jar.

I. Dr. Boettger finds that if on discharging the jar there was *no* interruption between one knob of the discharging rod and the knob in connection with the internal coating of the jar, in other words if I laid the knob of the discharging rod *directly* upon the knob of the jar and then pursued precisely the course stated above,* the phosphorus became ignited *every time* when the jar was charged with *positive* electricity, the phosphorus being stuck on to the needle connected with the outer coating, and either the knob or the point of the discharging rod being suddenly brought near it. On the contrary, if I stuck it on to the point of the discharging rod and brought the latter close, either to the point or the knob of the steel needle, it was *never* ignited when the jar was *full charged.* When the jar, however, contained merely a very weak charge, a single spark of an inch long for instance, drawn from the prime conductor, the phosphorus was ignited *every time.*

II. On charging the jar with *negative* electricity precisely the reverse was obtained. That is to say, the phosphorus, when stuck on to the steel needle connected with the outer coating, was *not ignited* by a *high charge;* but it took fire *every time* when stuck on to the point of the discharging rod, or when the jar, as in the above experiment, was charged with but a single weak spark. It cannot but be considered a remarkable phenomenon that the phosphorus *never* became ignited when treated as desoribed in I., but on the contrary that it *always* was so with a *full* charge of *positive* electricity when treated as in II., the phosphorus being in connexion with the *nega-*

*Alluding to an arrangement in which a needle, passing through a glass tube, was connected with the outside coating of the jar. The phosphorus was quite dry, and in pieces about as large as a pin's head. The discharging rods ended in fine points, on which small brass knobs could be screwed. G.

tive coating. And that with a *negative charge* if the phosphorus was in connexion with the *negatively charged knob of the jar*, it was always inflamed, while it *never* was in the other case, though it was so if the jar was charged with simply a very weak spark taken from the conductor of the machine. It is desirable that some person who has more spare time than I can command, should follow up experimentally, what is here mentioned in a general way only. Ibid.

Substitute for Mountain Barometers.

Sir,—In the selections that have been published from the proceedings of the British Association, at Newcastle, there is an account of a substitute for mountain barometers proposed by Sir John Robison, secretary of the Royal Society of Edinburgh. As considerable errors appear to have crept into the reports regarding this instrument, I deem it worth while to describe more fully its real character, premising that it is much simpler and more easily managed by unskilled travellers, than the description given at page 469 of your last volume would lead persons to suppose.

The instrument exhibited at the meeting consisted of a glass tube, about 1.25 inches diameter, and about 14 inches long, with a small bulb at the end. The capacity of the bulb appeared to be three or four times that of the inside of the tube. The stem of the tube was graduated by divisions, which had been experimentally formed by the instrument maker, in the following way:—At a time when the mercurial barometer was at 30 inches, and Fahrenheit's thermometer at 62°, the instrument was suspended within the receiver of an air pump, over a cup containing water; the air in the receiver being exhausted to a degree of rarefaction corresponding to 29 inches of the barometer, the instrument was then lowered until its lower end was immersed in the cup of water; air being admitted into the receiver, the water rose in the tube of the instrument, and its height was carefully marked. The instrument was again suspended in the receiver, and the exhaustion repeated until the barometer gauge indicated 28 inches; the immersion in the cup was then made, and a second mark put upon the stem. By continuing this process, the graduation of the stem was carried on as far as was thought requisite, when the instrument became ready for use.

It will be evident on reflection, that with a number of tubes graduated in this manner, a traveller arriving at a station in the midst of mountains may ascertain the tension of the air on the summits of all of them, by sending a messenger to each, with one or more of these tubes, and a tin case containing a little water. The messenger taking up the tubes with their stems open, the air within them partakes of the density of the atmosphere at the station visited, and if, when at the summit, the mouth of the tube is put into the water, and left in it while the messenger descends, the water will rise in the stem with the increasing density of the atmosphere, and will indicate, by its height, the degree of rarefaction of the air at the upper station, if the barometer at the lower one stands at 30 inches; if it be more, or less, a corresponding correction must be made for the difference.

If the temperature of the air at the upper and lower stations was the same, nothing further would require to be done; but as this will seldom or never be the case, unless the instrument at both stations can be put into water containing melting snow, it is necessary, where accuracy is required, to send up a thermometer with the messenger, that the temperature of the

instrument at the upper station may be noted, and a correction made for any difference that is observed between that and the one at the lower station.

This instrument is equally adapted for the use of æronauts, and will, I have no doubt, be very advantageously employed for many other purposes; ingenious in design, beautifully simple in its construction, accurate in its results, extremely portable, and easily managed, it strongly recommends itself to scientific tourists, &c. as a valuable addenda to their more costly apparatus. I remain, Sir, Yours respectfully,

WILLIAM BADDELEY.

London, October 23, 1838.

Lond. Mech. Mag.

Important Improvements in Stocking Weaving.

Our townsman, Mr. Robert Scott, has invented some ingenious machinery for working the stocking frame, which (though since the time of its original invention it has remained *in statu quo*) is now placed in the first rank of improvements, inasmuch as, prior to Mr. Scott's machine, a man could not manufacture more than 24 pairs per week, while this invention will enable a man and boy to produce 20 pairs per hour, or 100 dozens per week! The perfecting of this machine has been a work of immense labour, time, and capital, and reflects the highest credit on the ingenuity and perseverance of its talented inventor, and we confess we regret exceedingly that any thing should deprive him of his due reward. "It may be questioned, however," says a correspondent, "whether the advantages resulting from the present form of the machine, distributing the labour to all branches of the family of the poor, in their cottages, are not greater than those obtained by attaching it to steam power, and congregating the weavers in large factories. The time may come, indeed, when this may be the best form of employing labour, but it is at present accompanied with inconveniences of no trifling amount. The progress of mechanical invention, however, cannot be stayed by these advantages. We must avail ourselves of improvements as they arise, rather than suffer other districts, by adopting them, to rob us of that ancient inheritance, our stocking manufacture. The worsted branch of the hosiery trade has been so long established in this county, that we should look with suspicion upon any improvements of machinery adopted by other counties, before they are brought into actual competition. Several patents have, we understand, been obtained at Nottingham, for power stocking frames, of which the Nottingham papers have spoken very highly, and which, most likely, will result in something being done, though we are informed that all of them are much inferior in speed to the invention of Mr. Scott, whose improvements in the mode of working the common frame render it capable of being attached to power whenever the wants of the trade or the competition of our neighbours may render it necessary. The chief advantages of his plan are the rendering the labour of working a frame much easier and pleasanter when applied to hand labour, and the attainment of a speed greater than any other invention; the expense when attached to steam power, being small, and the wear and tear being less than by hand." Mr. Scott's engagement in another county prevents his further carrying out his intentions with respect to them; and he therefore purposes to sell his machines by auction, which will, no doubt, excite very considerable interest and competition.—*Leicestershire Mercury.*

Ibid.

Progress of Physical Science.

Short Account of some Researches upon the Variations which take place at certain Times of the Day in the temperature of the Lower Strata of the Atmosphere. By Professor MARCET.*

The author first examines the observations which had previously been made upon this subject, and more particularly those of M. Pictet, and of the English naturalist Six, undertaken towards the close of the last century. After demonstrating that the observations of these philosophers are not sufficient, in a satisfactory manner, to resolve the different inquiries which present themselves, the author proceeds to the description of the apparatus which he himself employed in the prosecution of the subject.

This apparatus consists in a mast 114 feet high, composed of two spars of fir, accurately connected with each other; divers precautions being taken that they should not be broken or overturned by the violence of the wind. It was placed in the most favourable situation for experiments of this kind, that is to say, in the midst of a great field, at a considerable distance from all habitations. The author adjusted, at the distance of every ten feet throughout the whole length of the mast, horizontal pieces of wood, to the extremity of which was attached a little pulley, by means of which the thermometers might be made to ascend and descend. The thermometers employed had their bulbs well covered with some good non-conducting substance, so that it might be certain their temperature did not vary during the time of their descent. Accurate notation was made, at the moment of every observation, of the meteorological condition of the atmosphere, and, in particular, of the indications of the hygrometer and of the ethrioscope.

The principal object which the author had in view in his researches may be regarded as a solution of the four following questions:—1st. To what extent the increase of temperature, which has been observed in proportion to elevation during certain periods of the day, is influenced by the condition of the sky, and the agitation of the air. To determine, 2dly, in a precise way, at what periods of the day this increase of temperature becomes perceptible; if it remain constant, or if it have a tendency to increase during the night? 3dly. Does the limit of elevation, at which this increase of temperature ceases, remain constant, or does it vary according to the meteorological state of the atmosphere? And 4thly. Whether the increase of temperature as well as the limit of its elevation, remain constant, or vary according to the different seasons of the year?

The author discusses these four questions successively, and gives an account of his various observations, which were all made during the year 1837, and the two first months of 1838. The results obtained have led to the following conclusions:

1st. The increase of temperature as you ascend, which is most conspicuous at the setting of the sun, however variable it may be, whether as regards its intensity, or its limit of elevation, is a constant phenomenon, whatever may be the condition of the sky; with the single exception of violent winds.†

* La Soc. de Phy. et d'Hist. Nat. de Geneve. March, 1838.

† The author establishes, by a great number of observations, that the phenomenon is not confined to those occasions in which the sky is clear and serene, as had hitherto been supposed. It also exists, though in a less degree, even when the sky is overcast; excepting always the periods of violent winds.

2d. The period of the maximum of this increase is that immediately following the setting of the sun. Starting from this time it remains stationary, or even frequently diminishes, especially when the dew is abundant.* At the time of sunrise, the increase is most frequently less than it was at sunset.

3d. The limit of elevation to which the increase of temperature extends, appears rarely to surpass the height of 100 feet, even when the sky is perfectly clear and serene. When it is very cloudy, and especially in winter, this limit is much lower.

4th. The increase of temperature in ascending, varies, both according to its intensity, and as to the limits of its elevation, according to the different seasons of the year. It is especially during the winter, and when the surface is covered with snow, that this phenomenon presents the most remarkable results.

The extraordinary severity of the last winter, enabled the author to make many observations upon the remarkable difference which may exist between the temperature of different strata of the air, but little separated from each other. The maximum of this difference amounted, on the 20th of January, to 14°.4 of Fahr. on a change of elevation of 50 feet. A thermometer placed at the height of two feet above the surface, indicating 3° Fahr., and another at the height of 52 feet, indicating at the same moment 17°.4. The mean difference, calculating upon twelve observations made during the period of excessive cold, between the temperature of two strata of air separated by an interval of 50 feet, was 10° Fahr. These differences were much less conspicuous during fine weather.

The comparison between the temperature of the air at *two* feet, and at *five* feet above the surface, perhaps presented still more remarkable results than the preceding, regard being had to their great proximity. The difference, calculating from the mean of nine observations (the surface being then covered with snow,) was 4°.2 in favour of the more elevated station; this difference, on the 4th of January, increased to 7°.2 Fahr.

A great number of trees in the neighbourhood of Geneva have suffered this winter from the intensity of the frost. The gardeners have remarked in many instances, that the lower part of the tree was frozen, whilst the upper branches remained perfectly uninjured. Localities even have been named where a great number of the trees were found frozen to the height of four or five feet, and remained green above this limit. The facts contained in this memoir of M. Marcet serve to account for these apparent anomalies.

Edin. New Philos. Journ.

British Association on Halley's Comet. By Sir J. Herschell.

One of the most interesting series of observations, of a miscellaneous kind, I had to make at the Cape of Good Hope, was that of Halley's comet. This comet is the great glory of modern calculation. To see the predicted return of such a body now verified for the second time, true to a single day,—nay, to a few hours—of his appointed time, after an absence of

* The author has almost constantly observed that an abundant descent of dew has a tendency to raise the heat of the strata of air which are nearest to the earth, and, consequently, to re-establish, to a certain point, an equilibrium between these strata and the superior ones.

seventy-five or seventy-six years, during which it has been subjected to the unceasing perturbations of all the planets, and especially persecuted by Jupiter and Saturn, those great stumbling blocks of comets, is really superb. However, what I have now to relate refers to a very singular and instructive fact in its physical history. I saw the comet for the first time, after its perihelion passage, on the night of the 25th of January. Mr. Maclear saw it on the 24th. From this time we, of course, both observed it regularly. Its appearance at first was that of a round, well-defined disc, having near its centre a very small bright object exactly like a small comet, and surrounded by a faint nebula. This nebula, in two or three more nights, was absorbed into the disc, and disappeared entirely. Meanwhile, the disc itself dilated with extraordinary rapidity, and by measuring its diameter at every favorable opportunity, and laying down the measures by a projected curve, I found the curve to be very nearly a straight line, indicating a uniform rate of increase; and by tracing back this line to its intersection with its axis, I was led, at the time, to this very singular conclusion,—viz. that on the 21st of January, at 2h. P. M., the disc must have been a point—or ought to have no magnitude at all! in other words, at that precise epoch some very remarkable change in the physical condition of the comet must have commenced. Well! all this was speculation. But here comes the matter of fact I refer to, and which, observe, was communicated to me no longer ago than last month by the venerable Olbers, whom I visited in my passage through Bremen, and who was so good as to show me a letter he had just received from M. Boguslawski, Professor of Astronomy at Breslau, in which he states that he had actually procured an observation of that comet on the night of the 21st of January. Well then, how did it appear? why, as a star of the sixth magnitude—a bright concentrated point, which showed no disc, with a magnifying power of 140! And that it actually *was* the comet, and no star, he satisfied himself, by turning his telescope on that point where he had seen it. It was gone! Moreover, he had taken care to secure, by actual observation, the place of the star he observed; that place agreed to exact precision with his computation: that star *was* the comet, in short. Now, I think this observation every way remarkable. First, it is remarkable for the fact, that M. Boguslawski was *able* to observe it at all on the 21st. This could not have been done, had he not been able to direct his telescope point blank on the spot, by calculation, since it would have been impossible in any other way to have known it from a star. And, in fact, it was this very thing which caused Maclear and myself to miss procuring earlier observations. I am sure that I must often have swept, with a night-glass, over the very spot where it stood in the morning before sunrise. And never was astonishment greater than mine at seeing it riding high in the sky, broadly visible to the naked eye, when pointed out to me by Mr. Maclear, who saw it with no less amazement on the 24th. The next remarkable feature, is the enormously rapid rate of dilatation of the disc and the absorption into it of all trace of the surrounding nebula. Another is the interior cometic nucleus. All these phenomena, while they contradict every other hypothesis that has ever been advanced, so far as I can see, are quite in accordance with a theory on the subject, which I suggested on the occasion of some observations of Biela's comet,—a theory which sets out from the analogy of the precipitation of mists and dews from a state of transparent vapor on the abstraction of heat. It appears to me, that the nucleus and grosser parts of the comet must have been entirely evaporated during its perihelion, and reprecipitated

during its recess from the sun, as it came into a colder region; and that the first moment of this precipitation was precisely that I have pointed out as the limit of the existence of the disc,—viz. on the 21st of January, at 2 P. M., or perhaps an hour or two later. Athenæum.

On some Preparations of the Eye. By Mr. Clay Wallace, *of New York.*

Sir David Brewster laid before the Section a series of beautiful preparations of the eye, made by Mr. Clay Wallace, an able oculist in New York, calculated to establish some important points in the theory of vision. As no paper accompanied these preparations, which had reached him at Newcastle, Sir David Brewster explained to the meeting their general nature and importance. Mr. Clay Wallace, he stated, considers that he has discovered the apparatus by which the eye is adjusted to different distances. This adjustment is, he conceives, effected in two ways,—in eyes which have *spherical lenses* it is produced by a *falciform*, or hook-shaped muscle attached only to one side of the lens, which by its construction brings the crystalline lens nearer the retina: In this case, it is obvious that the lens will have a slight motion of rotation, and that the diameter, which was in the axis of vision previous to the contraction of the muscle, will be moved out of that axis after the adjustment, so that at different distances of the lens from the retina different diameters of it will be placed in the axis of vision. As the diameters of a sphere are all equal and similar, Mr. Clay Wallace considered that vision would be equally perfect along the different diameters of the lens, brought by rotation into the axis of vision. Sir David Brewster, however, remarked that he had never found among his numerous examinations of the lenses of fishes any which are perfectly spherical, as they were all either *oblate* or *prolate* spheroids, so that along the different diameters of the solid lens the vision would not be similarly performed. But independent of this circumstance, he stated that in every solid lens there was only one line or axis in which vision could be perfectly distinct, namely, the axis of the optical figure, or series of *positive* and *negative* luminous sectors, which are seen by the analysis of polarized light. Along every other diameter the optical action of the lens is not symmetrical. When the lens is not a *sphere*, but *lenticular*, as in the human eye or in the eyes of most quadrupeds, Mr. Clay Wallace considers that the apparatus for adjustment is the ciliary processes, to which this office had been previously ascribed, though not on the same scientific grounds as those discovered by Mr. Wallace. One of the most important results of Mr. Wallace's dissections is the discovery of *fibres in the retina*. These fibres may be rendered distinctly visible. They diverge from the base of the optic nerve, and surround the *foramen ovale* of Soemmering at the extremity of the eye. Sir John Herschel had supposed such fibres to be requisite in the explanation of the theory of vision, and it is therefore doubly interesting to find that they have been actually discovered. Sir David Brewster concluded his observations by expressing a hope that anatomists in this country would turn their attention to this subject; and that with this view he would place the preparations of Mr. Clay Wallace in the Exhibition Rooms at Newcastle during the week. Ibid.

Note on the Structure of the Vitreous Humour of the Eye of a Shark. By Sir J. Herschel.

While crossing the Atlantic, on my return from the Cape, on the 31st of March of the present year, in lat. about 2° N., lon. about 20° W., we caught a shark. Having procured the eyes, which were very large, and extracted the crystalline lenses, the vitreous humour of each, in its capsule, presented the usual appearance of a very clear, transparent, gelatinous mass, of little consistency, but yet forming, very distinctly, a connected and continuous body, easily separable from every other part. Wishing to examine it more narrowly, it was laid to drain on blotting-paper; and, as this grew saturated, more was applied, till it became apparent that the supply of watery liquid was much too great to be accounted for by adhering water or aqueous humour. Becoming curious to know to what extent the drainage might go, and expecting to find that, by carrying it to its limit, a gelatinous principle of much higher consistency might be insulated, I pierced it in various directions with a pointed instrument. At every thrust, a flow of liquid, somewhat ropy, but decidedly not gelatinous, emanated; and, by suspending it on a fork, and stabbing it in all directions with another, this liquid flowed so abundantly, as led me to conclude that the gelatinous appearance of this humour, in its natural state, is a mere illusion, and that, in fact, it consisted of a liquid no way gelatinous, inclosed in a structure of transparent, and, consequently, invisible cells. The vitreous humour of the other eye, insulated as far as possible, was therefore placed in a saucer, and beaten up with a fork, in the manner of an egg beaten up for culinary purposes. By this operation, the whole was resolved into a clear watery liquid, in which delicate membranous flocks could be perceived, and drawn out from the water in thready filaments, on the end of the fork. From this experiment, it is clear, that the vitreous humour (so called) of this fish is no jelly, but simply a clear liquid, inclosed in some close cellular structure of transparent membranous bags, which, by their obstruction to the free movements of the contained liquid, imitate the gelatinous state.

Sir D. Brewster observed, that he had frequently found the vitreous humours of fishes' eyes to exhibit the greatest variety of color—green, rose-pink, &c. Ibid.

Water Spouts.

The connexion of water spouts with electro-magnetism, a favourite subject with some German naturalists, has been brought forward by Col. Reid in his memoir on storms, read before the British Association, and we hope it will not be lost sight of. The double cones in water spouts, one pointing upwards from the sea, the other downwards from the clouds, are interesting features in the phenomenon; these ought to be more particularly examined, and we should also ascertain whether the cloud above and the sea below revolve in the same direction with each other. We also suggest to those who may have an opportunity, to examine whether the rain which the spout projects in all directions is salt or fresh. Edin. New Philos. Journ.

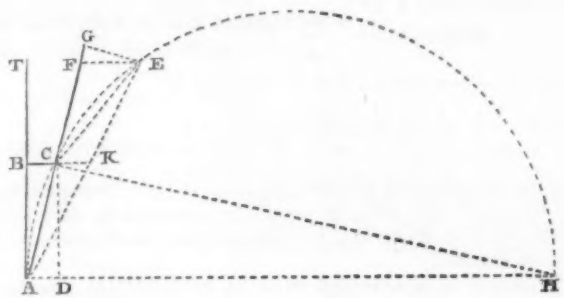
Fall of Rain from a Serene Sky.

Mr. Wartmann has informed M. Arago, that on the 31st day of May last, at two minutes after seven o'clock in the evening, there was a shower at Geneva, which lasted six minutes, the sky being perfectly clear at the zenith, and no cloud being visible in the neighbourhood of the place. This rain, whose temperature was lukewarm, fell vertically in drops, at first large and numerous, and gradually became smaller and smaller till it ceased. The thermometer at the time indicated a temperature of 65°.5 Fahr. The day had been one of frequent showers and sunshine.

Phenomena of the above kind, as well as others of an extraordinary character, dependent on peculiar states of the atmosphere, should be noticed by every meteorologist, in connexion with the indications of the barometer. G.

Progress of Civil Engineering.

Setting out Curves on Railways.



Sir,—Permit me, through the medium of your Journal, to call the attention of engineers on railways to the very erroneous method many of them adopt in setting out the curves, which, if intended to be segments of circular arcs—ought certainly to be so.

Of course it must be generally known, from the great radii of even the least of the curves on railways—it would be impracticable to strike them, as in the usual manner, from a fixed centre; but from the known relation between the sine and versed sine of an arc, the same object may be simply and expeditiously effected;—for instance, let A T be a tangent to the required curve at the point A; upon A T measure off any convenient length, A B, and from B draw B C perpendicular to A B = to the versed sine of an arc, whose sine is equal to A B, the point C is the locus of the curve at that point; for it is obvious, that A B = C D the sine of the arc A C; and B C = A D its versed sine; and this operation may be pursued to any convenient distance by continually increasing the sine and versed sine, thereby obtaining so many more points in the curve required. The formula for determining the versed sine A D. is of easy application, viz. A D = Rad—$\sqrt{\text{Rad}^2 - \sin^2}$. And, moreover, since the curvatures of circles vary inverse-

ly as their radii, when we have the versed sine of one arc, we may easily obtain the versed sine of arcs of any radii, without even the repetition of the above formula. Now, however simple this process may appear, many, in endeavouring to arrive at a higher degree of simplicity, adopt the following inaccurate method, by which the curves are any thing but what they are intended to be, and this I will endeavour to show:—

Let A C E be the proposed circular arc of a given radius, A T its tangent at the point A. Upon A T is taken any part A B, and from B is drawn $B\ C = \left(\frac{A\ B^2}{\text{diam.}}\right)$ perpendicular to A B, then the chord A C is produced to G, making C G = to A B, and from G is drawn the perpendicular G E = 2 B C, and the points A, C, E, are assumed as being in the circumference of the same circle, and other points in the circumference are found by producing the chord C E in the same manner as was before done with the chord A C, and drawing new perpendiculars each = to 2 B. C.

Now it may easily be proved, that not only the data by which the value of B C is assumed are incorrect, but that the curve thus determined is very far from being circular; on the contrary, it is one in which the radius of curvature is continually increasing.

Produce B C to K, and draw F E parallel to B K, join C H, A E and C E.

1st, It is evident that $\frac{A\ B^2}{\text{diam. } (A\ H)}$ is not equal to B C or A D, for (Cor. 8th Euc. 6th.)

$$A\ H : A\ C :: A\ C : A\ D$$
$$\therefore A\ D \times A\ H = A\ C^2$$
$$A\ D \text{ or } B\ C = \frac{A\ C^2}{A\ H}.$$

And A C is greater than A B, being the hypothenuse of the right $\triangle$ A B C. However, here the error is very trifling, if the sine be small in comparison with the rad.; but strictly speaking it is incorrect, and in circles of small radii the incorrectness would be serious.

2ndly, Where G E is assumed to be = to 2 B C is decidedly wrong. For (Euc. 32d 3rd b.) $<$ B A C = $<$ A E C; but in $\triangle$ G C E the $<$ G C E = two interior and opposite angles C A E and C E A (Euc. 32nd, 1st b.) $\therefore \angle$ G C E = $\angle$ B A E. Now the two $\triangle^s$ B A K, G C E are similar and equal; wherefore, (Euc. 26th, 1st b.) G E = B K. Again, since in $\triangle$ A F E, C K is parallel to F E, A F : A C :: F E : C K (Euc. 2nd, b. 6th;) but A F is less than 2 A C $\therefore$ F E is less than 2 C K—much more than is G E or its = B K less than 2 C K (since F E is the hyh. of the right angled $\triangle$ G F E.) And as B K is divided into two parts B C, C K, if the whole B K be much less than twice one portion C K, it evidently must be much greater than twice the other B C $\therefore$ B K or G E is much more than 2 B C; therefore, admitting the locus of the point C to be on the circumference of a circle of the given radius, the point E is not, if G E is made = to 2 B C—Q. E. D.

Trusting that this communication may not be without interest to some of your readers, I beg to subscribe myself, Sir, yours faithfully,

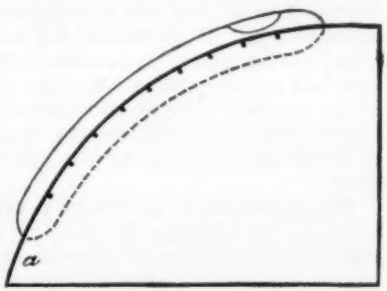
$\triangle$.

October 5, 1838.

Lond. Mech. Mag.

Notice of an Instrument to be used in Land Surveying, for reducing the Length of Lines over Undulating Surfaces to the Length of the Base, or Level Line. By Richard Varden, *Architect.*

The instrument which I am about to describe is of considerable service to persons engaged on parish, or other large, surveys, for allowancing their measuring chain on hilly ground; and, as it is but little known, you may like to have some account of it in the Architectural Magazine. It was invented by the late Mr. Webb of Salisbury, a surveyor of eminence, who invented and manufactured many of his own instruments, and his grandson, who made me acquainted with it, continues the use of it, as do several other surveyors in this neighbourhood, all of whom find it of material service. It consists of a wooden quadrant, 5 in. long, and 1 in. thick, let into the curved edge of which is a bent glass tube, nearly filled with spirit, and hermetically closed. The edge of the quadrant is covered with a plate of brass, divided in a manner similar to the scale for ascertaining the difference between a base and hypothenuse line which are on most theodolites. The mode of using it is, to place the bottom, or flat part, on an offset staff, laid parallel with the surface of the ground, the point *a*, being towards the ascent. Thus placed, the air bubble in the tube will stand against the figured brass scale, and indicate the number of links that must be added to every chain's length for that inclination. This allowance is to reduce the length of lines measured over sloping or undulating ground, to the length of the base, or level line, and is necessary in every survey, as the base of the land, and not the surface, is to be computed.



Worcester, Oct. 19, 1838.

Arch. Mag.

Trial of Anthracite Coal.

We understand that on yesterday week, a trial was made on the Liverpool and Manchester Railway, of the applicability of anthracite coal as a fuel for locomotive engines, under the superintendence of Mr. Woods, the talented engineer of that line, and with the approbation of the board of directors. Mr. E. D. Manby, an engineer connected with the South Wales anthracite district, who has devoted his attention most successfully to the introduction of this fuel, was present, and assisted in the trial.

The engine employed was the Vulcan, one of the smaller engines, used for conveying goods. The general result of the trial was highly satisfactory. In the first instance, the engine ran out without a load about six miles, and the coal was found to do very good duty, without any difficulty being experienced either with the tubes or in getting up the fires. It was noticed that the fuel burnt nearly without dust from the chimney, and entirely without smoke. The engine brought back a load of coal wagons

from the Hayton colliery, and acquired a speed, thus loaded, of twenty-one miles an hour, which is about the duty of the Vulcan.

Another trial was made in the evening, with the same engine, for the whole distance to Manchester, taking five loaded wagons. The journey was performed in one hour and twenty-nine minutes. The consumption of anthracite was only five and a half cwt., although a large portion was wasted from the fire bars being too wide apart for the economical use of this fuel. The engine would have used upwards of seven and half cwt. of coke for the same journey, with the same load.

We regard the success of this trial as likely to prove, in its result, a most important public benefit. The price of coke, as the demand for it for use in locomotive engines, or railways, has extended, has increased, in some places, almost 50 per cent.; and in districts which produce no coal, this enhanced price of coke will be seriously prejudicial to the success of railway undertakings. If anthracite can be generally applied to locomotive engines, we are given to understand that a saving of 30 to 40 per cent. in cost and quality will be effected. We have no doubt that the directors of our leading railways will instruct their engineers to follow up these experiments, and introduce such modifications into the form and workings of the fire boxes as the use of a new fuel may naturally be supposed to require.

The application of anthracite to marine engines is the next object most deserving the attention of practical men. The journalists of the United States appear to claim for their country almost the exclusive production of this invaluable fuel, which is destined to play so great a part in the iron manufacture, in railway locomotion, and in steam navigation; but the western part of the South Wales coal field, with reference to which Liverpool is, geographically, so favourably situated, contains stores of anthracite of much superior quality to those specimens from America which we have seen, and can produce it at a much smaller cost.—*Glamorgan Gaz.*

Mining Journ.

On the Limestone, the Lime Cement, and Method of Blasting, in the neighbourhood of Plymouth. By W. Stuart, *M. Inst. C. E.*

Plymouth abounds in limestone, which may be raised in solid masses of from three to ten tons; it is used most extensively for building and for lime manure. About 13 cubic feet weigh a ton; the limestone is of a light blue or gray colour, in general free from metallic veins, but with some indications of manganese and iron stone, round pieces of the latter being found in clay beds, intermixed with the rock, and a vein of iron stone four inches thick at the surface of the rock, and dipping towards the south, has been opened.

The author then proceeds to describe the general method of making cement in that neighbourhood, and the method which he has employed with considerable advantage.

The bit, or iron rod, called a jumper, is generally used. In pitching a deep hole, a two-inch bit is used for about four feet, and a $1\frac{7}{8}$-inch for the next four feet, by one man; then two men are employed with $1\frac{3}{4}$-inch to the depth of 14 feet, and $1\frac{5}{8}$-inch to the depth of 21 feet. A constant supply of water is required during boring the hole. The hole being well dried, about one-third is filled with powder, say 15 lbs.; a needle is introduced as

far as possible without driving it; the hole is tamped with dry clay to the top, and then covered with a little wet clay, to prevent any of the loose particles falling in when the needle is withdrawn. A reed filled with powder, and split at the top, to prevent its falling to the bottom of the hole, is inserted, and a stone laid upon it; the powder being ignited by a piece of touch paper and a train, the reed flies to the bottom of the hole, and ignites the main load. The rock is generally cracked and loosened to a considerable extent, if not thrown; in that case, the needle is driven through the tamping, and such a fresh charge is run through the needle hole as may be requisite. From six to eight tons of rock are generally blasted with one cwt. of gunpowder. The paper is accompanied with drawings of the jumpers, the tamping bar, the needle, and the discharging reed. Jour. Arts & Sci.

Mechanics' Register.

Caoutchouc Tree.

This substance being now used for so many important purposes, perhaps the following account of the majestic tree which produces it may prove interesting.

The caoutchouc is generally a solitary tree, although occasionally two or three may be found together. It is among the most magnificent of forest trees, and is only second to the banyan, because that tree admits of indefinite extension. Such is the size of the caoutchouc, that it may be distinguished from a distance of several miles by its dense and lofty crown. The dimensions of one of the largest are as follows:—the circumference of the main trunk, 74 feet; of the main trunk and the supporters, 120 feet; and of the area covered by the branches, 610 feet, more than a tenth of a mile! the height is 100 feet. The appearance of the tree is majestic. It throws out shoots both from the main trunk and from the branches, and these often cohere with the trunk and with each other. When more are thrown out from the main trunk, or near it, they sometimes run down its surface, and impart to it the picturesque appearance of the most elaborate sculpture. Frequently the caoutchouc plants itself on other trees, and as soon as it is firmly fixed, casts down its roots to the ground. These seek each other; a net work is soon formed, which at length grows into a solid and firm cylinder round the tree which received the young seedling, and is eventually stifled in the embrace of the caoutchouc. The juice is procured from transverse incisions in the large root. The incision penetrates the wood, but the flow of juice is from the bark alone. Under the incision a hole is scooped in the earth, in which a leaf, folded up like a cup, is placed. The fluid, when good, is nearly of the consistence of cream, and of a very fine white colour. Many incisions are made in one tree; the juice flows rapidly at first, but diminishes in a few moments. It flows more copiously during the night. In two or three days a layer of caoutchouc is formed over the wound, and the flowing ceases.—*Friend in India.* Min. Journ.

New Mines in Egypt.

The Pacha of Egypt may find some consolation for the loss of his monopoly in the general speculation forced on him by the treaty between England and

Turkey, in the recent discovery of gold mines in Upper Egypt, the product of which is reputed to have turned out even more rich than was originally supposed. A vein of silver, extremely rich, is stated to have been discovered at Königsberg, the old capital of Prussia. The "Precurseur," a journal published at Antwerp, announces that a mine of iron ore has lately been discovered at Capellen, in the province of Antwerp, of a quality superior to that imported from England. It is being worked with activity, and some boat loads have already been sent to Charleroi. Lond. Mech. Mag.

Presentation of Plate to Dr. Gregory.

Our readers are aware that Dr. Gregory resigned his appointment as Professor of Mathematics at the Royal Military Academy, Woolwich, in June last. We have just learnt that the company of gentlemen cadets, who are educated in that institution, have done great honour both to themselves and the Doctor, by presenting to him an ornamental piece of plate, value 150 guineas, as a testimonial of their affection and respect. It is an elegant silver vase, with a suitable inscription and appropriate emblems, including the arms of the cadet company as well as the Doctor's arms; the vase, which is 13 inches in diameter, is supported by a cubic pedestal of the most tasteful work. The entire design, which is of a beautifully classical nature, is due, we understand, to one of the senior cadets. The circumstance of this presentation must be the more gratifying to Dr. Gregory on retiring from his long career of official duty, as, during the whole history of the Royal Military Academy, extending over a period of nearly a hundred years, this is the only testimonial of the kind which has ever been presented to a retiring professor. Idem.

Cement for Book-Binding.

Nickels and Collins have taken out a patent, in England, for an elastic cement for combining the leaves of books together, which they pronounce to be cheaper, more expeditious, and better, than India Rubber. G.

They dissolve a pound weight of isinglass, or of the best glue, in three quarts of hot water, and incorporate about a quarter of an ounce of linseed-oil with a quarter of a pound of dry coarse sugar, and when the sugar has taken up all the oil, it is added by degrees to the dissolved isinglass or glue, stirring it until well mixed; the whole is then to be boiled together, until it is of that consistence that it may be laid on when hot, or in a fluid state, with a brush. The book is then to be rounded at the back, either in sheets or in single leaves, and put into a press, leaving the back protruding, and a coat of this cement is to be laid on hot, or rather warm, upon the back, and well rubbed in, that the back-edges may be well saturated therewith. A piece of calico, or any other texture or fabric is to have a coat of the same cement, and to be pressed over it, to confine all the leaves together when dry, which in a warm room will be in a short time; the book is then ready to be boarded and finished off in the usual way. The above is the cement which Messrs. Nickels and Collins state they believe to be the best for the purpose, but variations may be made, provided gelatine is a constituent part, either incorporated with albumen or the mucilage of vegetables. Ibid.

Chrysalis of Silkworms.

A letter from M. Favand, a missionary in China, states, that during his long residence in that country he has often seen the chrysalis of silkworms used as food. He has himself partaken of them, and found them at once strengthening and cooling, and particularly good for delicate persons. After having wound the silk off the cocoons, they are dried in the frying-pan, in order to get rid of the aqueous matter. The envelope will then come off of itself, and they look like little yellow masses resembling the eggs of carp. They are fried in butter, lard, or oil, and moistened with broth, of which, that of chicken gives the best flavor. When they have been boiled in this way for five minutes, they are crushed with a wooden spoon, and well stirred up from the bottom. The Mandarins and rich people add the yolks of eggs, in a proportion of one yolk to 100 chrysalises, and when this is poured over it, it becomes a golden-colored cream, and is of an exquisite flavor. The poorer people are contented with salt, pepper, and vinegar, or, after stripping them, cooking them with oil. Athenæum.

Fermentation an Act of Vegetation.

M. Turpin has lately published his observations upon certain phenomena which he considers sufficient to show, that the act of fermentation, concerning which chemists have been so much embarrassed, is owing to the rapid developement of infusorial plants. He states, that all yeast, of whatever description, derives its origin from the separation from organic tissue, whether animal or vegetable, of spherical particles of extreme minuteness, which particles, after a certain time, rise to the surface of the fluids in which they are immersed, and there germinate. Their germination is said to be caused by a certain amount of heat, and by contact with atmospheric air. The carbonic acid obtained by fermentation is ascribed to the infusorial plants. M. Turpin considers the act of adding yeast to liquids, when fermentation is languid, as equivalent to sowing millions of seeds in a favorable soil. He calls the yeast plant of beer *Torula cerevisiæ:* he considers each infusion to have its peculiar plant, and he names the whole race of such beings *Levurians.* No doubt the yeast of beer consists of minute molecular matter, the particles of which are globular; and that those particles produce, from their sides, other particles like themselves, which eventually separate from the parent, but we do not know that they are *therefore* plants. Ibid.

Jones' Machine for Moulding Bricks.

The earth in its descent, is forced into the moulds by great pressure as they pass under the Pug-Mill, and is delivered therefrom in perfect bricks upon pallet-boards ready to be removed, the whole of which is done by the horse attached in the usual mode to the Pug-Mill, producing from 1000 to 2000 bricks per hour. The earth also being moulded with only one-half the usual quantity of water will take considerably less time to dry, consequently there may be nearly double the quantity of bricks made upon the same space of ground. A machine was at work last week on three successive days, at Messrs. Webb's brick-field, near Ball's Pond Church, Islington, and performed the work admirably. Lond. Mech. Mag.

LUNAR OCCULTATIONS FOR PHILADELPHIA, MAY, 1839.					Angles reckoned to the right or westward round the circle, asseen in an inverting telescope. ☞ For direct vision add 180° ☜	
Day.	H'r.	Min.	Star's name.	Mag.	from Moon's North point.	from Moon's Vertex.
5	13	42	Im. χ' Capricorni	5,6	61°	16°
5	14	32	Em.		333	294
11	16	18	Im. ψ Arietis	6	107	58
11	17	7	Em.		305	254
27	9	5	Im. m Scorpii	6	107	77
27	10	6	Em.		203	183

Meteorological Observations for November, 1838.

Moon.	Days	Therm. Sun rise.	Therm. 2 P.M.	Barometer. Sun rise.	Barometer. 2 P.M.	Wind. Direction.	Wind. Force.	Water fallen in rain.	State of the weather, and Remarks.
				Inch's	Inch's			Inches.	
☉	1	25	40	30.30	30.20	W.S.S.E.	Brisk.		Clear—do.
	2	35	55	30	00	W.	Moderate.		Clear—do.
	3	36	61	29.98	29.96	S.	do.		Clear—hazy.
	4	40	56	96	80	S.	do.	1.30	Rain—do.
	5	52	57	60	50	N.	do.	.03	Cloudy—rain.
	6	40	50	70	30.00	W.	Brisk.		Clear—do.
☽	7	34	54	30.20	10	E.S.E.	Moderate.		Lightly cloudy—do. do.
	8	63	66	29.65	29.55	S.	Brisk.	1.04	Rain—cloudy.
	9	36	35	82	90	W.	do.		Cloudy—clear.
	10	24	33	30.50	30.60	W.	Moderate.		Clear—do.
	11	26	39	65	70	S.E.	do.		Partially cloudy—do. do.
	12	30	49	40	36	S.W.	do.		Clear—lightly cloudy.
	13	40	60	10	29.96	S.E.	do.		Lightly cloudy—do.
	14	48	59	00	30.05	W.	do.		Fog—cloudy.
⊗	15	54	63	00	29.95	S.E.	Brisk.	.45	Rain—cloudy.
	16	58	50	29.76	75	S.W.W.	Moderate.		Cloudy—do.
	17	31	39	30.10	30.15	W.	do.		Clear—do.
	18	31	33	05	29.90	N.E.	do.		Cloudy—snow.
	19	25	32	29.90	96	W.	do.	.05	Clear—do.
	20	23	39	30.00	91	W.	do.		Clear—flying clouds.
	21	31	49	05	30.06	W.	do.		Clear—do.
	22	35	52	29.86	29.85	W.	do.		Partially cloudy—clear.
	23	38	54	84	80	S.W.	do.		Cloudy—hazy.
☾	24	34	38	85	90	N.E.W.	do.		Cloudy—partially do.
	25	16	20	30.15	30.10	N.	do.		Cloudy—partially do.
	26	18	30	15	15	N.	Brisk.		Clear—do.
	27	24	38	00	29.87	S.W.	Moderate.		Clear—cloudy.
	28	30	38	29.80	83	W.	do		Clear—do.
	29	19	39	30.10	30.10	W.	Brisk.		Clear—do.
	30	25	42	10	10	W.	do.		
	Mean	34.27	45.33	30.03	30.00			2.87	

	Thermometer.	Barometer.
Maximum height during the month.	66. on 8th.	30.80 on 11th.
Minimum " " "	16. 25th.	29.50 5th.
Mean	39.80	30.015

METEOROLOGICAL REPORT

FOR THE STATE OF PENNSYLVANIA,

Collated from returns made to the Committee on Meteorology of the Franklin Institute of the State of Pennsylvania, for

MARCH, 1839.

	County.	Town.	Observer.	Thermometer. 7, A. M.	2, P. M.	9, P. M.	Maximum.	Minimum.	Mean.	Days omitted.	Register. Lowest.	Mean.	Days omitted.	Barom. 7, A. M.	2, P. M.	9, P. M.	
1	Philadelphia,	Philadelphia,	J. P. Espy.	36.71	48.56	41.47	76.50	15.	42.25		15.	36.05		30.03	29.98	30.01	30.
2	Montgomery,																
3	Bucks,	Newtown,	L. H. Parsons.	34.98	47.14	39.28	74.	12.	40.47	4 2/3				29.93	29.88	29.96	30.
4	Lehigh,																
5	Northampton,	Easton															
6	Monroe,	Stroudsburgh,															
7	Pike,																
8	Wayne,																
9	Susquehanna,	Silver Lake,	E. Rose.	29.61	43.65	36.03	69.	—7.	36.43		—7.	27.84		28.03	28.03	28.04	28.
10	Luzerne,																
11	Schuylkill,	Pottsville,	John Porter.	30.26	45.31	35.64	75.	8.	37.07	1/3	4.	28.10	1	29.26	29.23	29.18	29.
12	Berks,	Reading,	C. F. Egelman.	34.45	43.55	37.42	76.	9.	38.47					29.77	29.77	29.77	30.
13	Chester,	West Chester															
14	Delaware,	Haverford,	Haverford School.	34.39	46.73	40.42	74.	12.	40.58	1	11.	32.53		29.59	29.55	29.57	30.
15	Lancaster,	Lancaster,	Conservatory of Arts,	35.76	50.14	38.60	79.	10.	41.50	1 1/3	9.75	32.71		29.51	29.49	29.51	30.
16	York,	York															
17	Lebanon,																
18	Dauphin,																
19	Northumberland	Northumberland,	Andrew C. Huston.	35.47	46.76	39.47	74.50	12.	40.57		—1.	26.63		29.45	29.42	29.44	30.
20	Columbia,	Danville,	C. H. Frick.	31.58	49.95	38.73	76.	0.	40.09	2/3	0.	26.07	1	29.49	29.53	29.56	30.
21	Bradford,																
22	Tioga,																
23	Lycoming,																
24	Union,	New Berlin															
25	Mifflin,	Lewistown,	J. Culbertson, M. D.	37.40	45.75	40.99	72.	15.50	41.38	2 1/3				29.38	29.31	29.36	29.
26	Juniata,	Mifflintown,	Andrew Parker.	41.58	44.35	44.94	68.	23.	43.96					29.68	29.68	29.66	30.
27	Perry,	New Broomfield															
28	Cumberland,	Carlisle,	Prof. W. H. Allen.	33.30	46.71	38.67	72.	6.	39.56	1/3	5.	29.16		29.45	29.45	29.46	29.
29	Adams,	Gettysburgh,	Prof. M. Jacobs.	33.90	49.05	38.90	76.	8.50	40.62		8.	30.05		29.44	29.40	29.40	30.
30	Franklin,	Chambersburgh,															
31	Huntingdon,																
32	Centre,	Bellefonte,	John Harris.	26.32	46.13	34.21	76.	—13.	35.55	2/3	—7.	22.87	8	29.25	29.19	29.27	29.
33	Potter,																
34	M'Kean,	Smithport,	Richard Chadwick.	25.45	42.29	29.32	64.	—8.	32.35		—14.	21.55		29.59	29.68	29.64	30.
35	Clearfield,																
36	Cambria,																
37	Bedford,																
38	Somerset,																
39	Indiana,																
40	Jefferson,	Rose Cottage,	Charles C. Gaskill.	28.00	45.25	33.26	77.	—18.	35.84	1	0.	27.43	3	29.09	29.06	29.15	29.
41	Warren,																
42	Venango,																
43	Armstrong,																
44	Westmoreland,																
45	Fayette,																
46	Green,																
47	Washington,	Canonsburgh															
48	Alleghany,																
49	Beaver,																
50	Butler,																
51	Mercer,																
52	Crawford,	Meadville,	Fred. Huidekoper.	28.35	44.45	31.73	75.	—15.	34.84		—15.	24.84		28.72	28.74	28.72	29.
53	Erie,	Erie															

egister.		Barometer.							Weather.															
Mean.	Days omitted.	7, A. M.	2, P. M.	9, P. M.	Maximum.	Minimum.	Mean.	Days omitted.	Clear.	Cloudy.	Rain.	Snow.	Rain and Snow.	Thunder Showers.	Rain in inches.	Days omitted.	North.	N. N. E.	N. E.	E. N. E.	East.	E. S. E.		
36.05		30.03	29.98	30.01	30.60	29.38	30.01		18⅓	12⅔	6	1	1				2	⅓	1⅔	1	⅓			
		29.93	29.88	29.96	30.45	29.38	29.92	5	10⅔	12					2.500	8⅓		⅓	3⅓					
27.84		28.03	28.03	28.04	28.50	27.60	28.03		19	12					1.460		4⅓							
28.10	1	29.26	29.23	29.18	29.87	28.28	29.22	⅓	15⅓	15						⅔	1⅓							
		29.77	29.77	29.77	30.25	29.25	29.77		16⅓	14⅔	6		2				2		1⅔		⅔			
32.53		29.59	29.55	29.57	30.09	29.10	29.57	1⅔	16	13					1.461	2	⅓		3⅔		⅓			
32.71		29.51	29.49	29.51	30.04	28.89	29.50	1⅓	16⅔	13	6	1	1		1.006	1⅓	2	⅓	1⅔					
26.63		29.45	29.42	29.44	30.02	28.87	29.43		12⅓	18⅔	3	2	2		1.149		6⅓		2		1⅓	⅔		
26.07	1	29.49	29.53	29.56	30.10	28.95	29.53	⅔	14⅔	15⅔						⅔	1		⅔		⅔			
		29.38	29.31	29.36	29.87	28.88	29.35	3	15⅓	13⅔	9	2	1			2		1⅓	4					
		29.68	29.68	29.66	30.10	29.40	29.67	⅓									5		⅔		⅔			
29.16		29.45	29.45	29.46	29.99	29.01	29.45	⅓	14⅓	16⅓	2	1	1		.790	⅓	⅔	⅓	2		⅓	1⅓		
30.05		29.44	29.40	29.40	30.07	28.87	29.42		18⅓	12⅔	6	3			.845		3	2⅔	2	⅓		⅓		
22.87	8	29.25	29.19	29.27	29.88	28.73	29.24	⅔	15⅓	15	4	1	1		1.556	⅔	5	⅔	2⅓		1			
21.55		29.59	29.68	29.64	30.00	29.45	29.64		16⅓	14⅔	7	6			3.324				⅓		⅔			
27.43	3	29.09	29.06	29.15	29.56	28.62	29.10	⅔	14	16⅓	7	1	1		1.875	⅔	2⅓							
24.84		28.72	28.74	28.72	29.25	28.29	28.73		17⅔	13⅓	5	1	3	1	3.348		2⅓	5	1	⅔	5	⅔		

Winds.															Hygrometer.				
E. N. E.	East.	E. S. E.	S. E.	S. S. E.	South.	S. S. W.	S. W.	W. S. W.	West.	W. N. W.	N. W.	N. N. W.	Calm.	Days omitted.	Dew-point.	Days omitted.	Wet Bulb.	Days omitted.	No. of Report.
1					1	2	3		1	1	5		5	3			40.54		678
			1				8				11			6					795
					3		5		6		8	2							754
			3				1		5		13		5						691
			1				9		1		14								680
					4		9	1	5		3		1	2					696
			3		1		4				7		8	8	32.63	2	41.62	1	698
			1	1	2		2		3		4	1	3				48.43		679
			1		1		7		5		2		10	1	26.90	2	39.89	12	709
						2	4				10	1		6					734
			2		1		4		7		9								681
		1			2		3	1	5		4		8		28.46	3	40.46	3	683
					2	1	4	1	3	2	4		1		30.82		41.51		717
	1				3		4	1	7		3			1					685
			4				7		9		5		3		36.03	5	43.05	3	699
					1		4		2		2		16	1	33.74	4	42.54	5	700
	5		3	1	2		1		3		1		4						722

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